Alberta

ANALYSIS OF POPLAR - BASED PANELBOARD DEVELOPMENT PROGRAM OPTIONS FOR ALBERTA

CARROLL-HATCH (INTERNATIONAL) LTD.
VANCOUVER, CALGARY

PROJECT Nº. 3101

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Prepared for:

PROVINCE OF ALBERTA
Department of Energy and Natural Resources
Department of Economic Development
Alberta Research Council

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INTRODUCTION

Alberta controls, on Crown lands, approximately 25% (17 billion cubic feet) of Canada's total reserves (66 billion cubic feet) of economically recoverable poplar species [1]. This vast fibre resource base has remained virtually untouched in all provinces, including Alberta. Over the past two decades, both the Federal and Provincial governments have expended considerable amounts of time and money on basic research into the physical and chemical properties of poplar, assisted to a limited degree by the private sector. Despite the availability of this comprehensive range of research and development material commercial exploitation of poplar still remains minimal. In all of Canada approximately 68 million cu.ft. of poplar is consumed annually, representing only 5% of the estimated annual allowable cut of 1,435 million cu.ft.

The principal findings of the extensive Research and Development (R&D) programs were that poplar's characteristics were eminently suitable for the manufacture of reconstituted fibre products such as pulp or wood-based panels.

Poplar's conversion into pulp has been the subject of many previous studies and will not be discussed in this report. Poplar has gained reasonable acceptance as pulp furnish but the use of poplar in the manufacture of wood-based panels has increased at a very low rate over the past few years. Most of this expansion has taken place outside of Alberta despite Alberta's control of the largest proportion of total available poplar in Canada.

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1. In this instance and throughout this report the generic term "poplar" refers to tembling aspen, Populus tremuloides and "black" poplar, P. balsamifera. These species which contain several sub-varieties have very similar physical and growing characteristics and embrace virtually all of the poplar resource in Alberta. Minor volumes of black cottonwood, P. trichocarpa and other varieties are found in Southern Alberta.

INTRODUCTION (cont'd)

As an inducement to the private sector to expand the poplar-based panel products industry in Alberta, the Research Council in 1981 proposed the establishment of a panelboard R&D facility in Alberta. In essence, this facility has been conceived as a pilot plant with the capability of producing almost the complete range of established wood-based panel products as well as providing the opportunity for product/process development activity for both established and new products.

Before proceeding with construction of the pilot plant, however, the Research Council, in conjunction with the Department of Energy and Natural Resources and the Department of Economic Development decided to obtain clarification of the following key issues:

1. Would the pilot plant act as an effective inducement to the private sector to either expand existing plants or to construct new units in Alberta to utilize increased volumes of Alberta's poplar resource?
2. Would the proposed plant receive wide-spread industry support financially as well as morally?
3. What other inducements, if any, may prove more effective than the pilot plant in attracting poplar-based industry into Alberta?

In December 1981, to obtain clarification of these key points and to determine trends in the wood-based panelboard industry, the Government of Alberta [1] retained the services of Carroll-Hatch (International) Ltd., Vancouver and Calgary, to conduct a study of the panelboard industry with particular regard to the place of R&D within that industry. This report presents the results of Carroll-Hatch (International) Ltd.'s (C-H) findings.

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1. Acting through a committee composed of representatives from the Department of Energy Research Council and Natural Resources and the Department of Economic Development.

INTRODUCTION (cont'd)

In summary, the study included an analysis of the present and future composition of the panelboard industry, the value of a pilot plant to that industry as well as to Alberta, and the identification of several alternate industrial development incentives.

To compile the information necessary to achieve the study's objectives, C-H conducted interviews with a broad range of manufacturers, distributors, consumers, researchers and other groups, such as transportation officials, relevant to the panelboard industry. In all, 203 interviews were held in both Canada and the United States. A detailed listing of interviews is presented in Appendix 2. Additional sources of information included previous reports and studies published by both the public and private sectors, statistical data compiled by domestic and international agencies and material extracted from C-H's files and records.

For ease of presentation and reading, the report has been prepared in four separate sections:

Part I	-	Panel Products Industry.
Part II	-	Research & Development Industry.
Part III	-	Transportation Considerations.
Part IV	-	Industrial Development Incentives.

Discussions in Part I commence with an analysis of trends in the international markets for panel products. For Canadian forest products manufacturers, the development of export sales has proven to be an essential ingredient to any successful marketing program and trends in international market regions are therefore significant to any potential development in Alberta.

INTRODUCTION (cont'd)

The review of international trends is followed by an examination of developments in North America and this in turn is followed by a review of Canadian trends with particular reference to the probable impact of these trends on Alberta.

Following the analysis of the panel products industry, a summary of the forest products R&D industry in Canada is presented in Part II and the probable role of an R&D facility in Alberta is discussed.

The impact of transport costs on the distribution mechanics of panel products is analysed in Part III, and this in turn is followed in Part IV by a review of various industrial development incentives suggested by the more knowledgeable interviewees.

REPORT SUMMARY

1. For a number of technical and economic reasons, Canada's vast poplar resource has remained virtually untouched - less than 5% of an estimated allowable annual cut of 1.4 billion cubic feet is utilized.

2. This non-utilization factor is especially significant to Alberta which controls 25% (17 billion cubic feet) of Canada's total poplar reserves.

3. To encourage private industry to raise the present low utilization ratio, the Alberta Research Council is considering the establishment of panelboard development facilities in Alberta.

4. Before proceeding with construction, the Government of Alberta, acting through a committee composed of representatives from the Department of Energy and Natural Resources, the Department of Economic Development, and the Alberta Research Council, commissioned Carroll-Hatch (International) Ltd. (C-H) to conduct a study to provide answers to the following questions:

   (i) Would the panelboard development facility act as an inducement to the private sector to either expand or construct plants in Alberta to process poplar?

   (ii) Would the proposed development facility receive wide-spread financial support from industry?

   (iii) What alternative inducements, if any, may prove more effective in attracting poplar-based industry to Alberta?

REPORT SUMMARY (cont'd)

5. This report presents the results of C-H's study. In addition to extracting data and information from a wide range of government and industry statistics, previously published reports and data in files, C-H conducted 203 field interviews with a broad spectrum of relevant and knowledgeable industry and government officials.

6. The results of the study fell naturally into four separate but related sections:

   Part I - Panel Products Industry
   Part II - Research & Development Industry
   Part III - Transportation Considerations
   Part IV - Industrial Development Incentives

7. Analysis of the international and national panel products industry identified the following broad trends:

   (i) Between 1950 and 1979, world production and consumption of panel products has increased at more than three times the comparable rate for lumber (8% vs 2.4%/per year).

   (ii) During the same period, consumption (demand) of panel products became much more diversified geographically, with North America's share of total world consumption declining from 63% to 37%.

   (iii) World production of wood-based panel products increased from 11.52 to 106.6 million cubic metres between 1950 and 1979. The share of this total contributed by particleboard and fibreboard increased from 47% to 56% while plywood's share declined from 53% to 41%.

REPORT SUMMARY (cont'd)

(iv) These are significant trends for Alberta since poplar is only marginally suitable for lumber and plywood but eminently suitable for any of the reconstituted wood panels.

(v) In North America waferboard has begun to displace softwood plywood as the leading structural type panel. The production cost of waferboard (produced almost exclusively from poplar) is significantly lower than that of softwood plywood and this differential will undoubtedly increase. The future demand for structural panels in North America is projected to increase at a rate equivalent to the capacity of approximately 7 new plants per year. This demand can be satisfied almost entirely with waferboard.

(vi) The growth rate of the non-structural panels in North America is expected to be more modest than that for structural panels. Most of the increase is expected to occur in Medium Density Fibreboard, and specialty particleboard types such as high-density board.

Alberta's poplar resource is technically suitable for the types of panelboard likely to enjoy the strongest growth rates and the overall market could easily absorb substantial volumes from Alberta. However, other considerations, particularly transportation costs (discussed later) severely limit Alberta's market potential.

8. Expenditures on forest-related R&D activities in Canada amounted to $142 million in 1979, of which approximately 12% was directed to wood products research. The total Canadian expenditure amounted to less than 0.4% of the value of shipments of forest products compared with a ratio of 0.8% for all manufacturing. In other words, forest related R&D expenditures are equivalent to half of the national average.

REPORT SUMMARY (cont'd)

9. Response to the critical question of the value of the proposed panelboard development facilities to Alberta is summarized:

   (i) None of the interviewees believed that the proposed facility would act as an inducement to industry to expand operations in Alberta.

   (ii) Approximately 33% believed that the center would be desirable but none would support the plant financially.

   In summary, the proposed plant would be regarded as a convenience but would not receive financial support from industry except possibly on an intermittent lease basis.

10. Transportation costs from Alberta to the principal North American markets combined with the fact that, except for softwood plywood and waferboard, all of the panel products can be manufactured from any fibrous waste material severely limit economical shipping distances. Acceptable low-quality logs are available in substantial volumes for waferboard in regions much closer to most North American markets than from any Alberta site.

11. Analysis of the effects of transportation costs indicate clearly that developing overseas markets would be a critical element in any successful poplar-based industrial development in Alberta.

12. Alternative industrial development incentives proposed by the more knowledgeable interviews were:

    1. Semi-Commercial Development Centre
    2. Pre-Development Assistance
    3. Standard Development Incentives
    4. Transportation Cost Equalization

REPORT SUMMARY (cont'd)

13. Except for Quebec and the Maritimes most provinces offer fairly standardized industrial development programs. Both Quebec and the Maritimes account for a disproportionate (population) share of federal incentive funding.

14. Transport cost equalization subsidies would be readily understood and directly applicable but complex and costly to implement and administer. Additionally, the reaction of U.S. producers to subsidized shipments into the U.S. market would undoubtedly be vigorously negative and might provoke anti-dumping action.

15. Semi-commercial development (expand process development center to semi-commercial production) appears to offer the opportunity to make the panelboard development facility economically viable, but industry reaction to a government owned (and possibly subsidized) plant should be carefully evaluated.

16. Pre-development assistance, which includes preparing and making available current, detailed forest inventory data; preparation of data on supply, services and costs for selected sites and identifying specific market opportunities was considered by many interviewees to be an effective method of encouraging poplar-based industrial expansion in Alberta.

SUMMARY OF RESULTS AND CONCLUSIONS

Results

1. The rate of increase in consumption of all panel products has been much greater than that for lumber and will probably continue at a strong rate into the future.

2. Of the structural panels - plywood and waferboard primarily - waferboard has enjoyed an exceptionally strong demand growth rate and is expected to displace structural grade plywood for most structural/exterior applications.

3. Of the non-structural types - particleboard, hardboard and rigid insulation board - only particleboard, particularly types such as Medium Density Fibreboard and "thinboard", are expected to experience reasonable growth in demand. The remainder do not appear to be attractive investment opportunities.

4. Alberta's location relative to major markets combined with the availability of adequate volumes of fibre supply close to most North American markets diminishes the value of Alberta's poplar resource as a furnish for panel products and makes the development of overseas markets essential.

5. Interviewees agreed unanimously that the proposed panelboard development facility would be ineffective in attracting poplar-based industry to Alberta.

6. Most interviewees believed that the facility would be a useful addition to the forest products industry but none would commit to either financial support or to minimal lease arrangements.

Conclusions

1. Transport cost analysis indicates that Alberta panel products manufacturers can expect a contraction of economically available markets in North America as the process of "regionalization" of manufacture of fibre-based panel products accelerates.

2. Of the many suggestions made by interviewees for attracting poplar-based industry into Alberta, i.e., semi-commercial production, pre-development package, standard development incentives, and transportation subsidies, the most promosing and least troublesome appears to be the pre-development package.

3. Alberta does possess a vast source of valuable fibre and the successful exploitation of this valuable resource will be governed almost entirely by the identification and securing of markets which can be serviced profitably from an Alberta location.

4. Government support in the form of low-cost loans or some other type of subsidy is regarded as secondary to the need for establishing economically acceptable net mill sales returns. If this condition can not be satisfied, most interviewees believed that in the long term, despite subsidy, any development program would prove unsuccessful.

RECOMMENDATIONS

1. If the decision is made to proceed with construction of the proposed development facility, it is recommended that the facility be regarded as a research and development centre only and not as an inducement to industry to expand poplar-based manufacturing in Alberta.

2. A detailed inventory of the timber resource economically available to selected industrial sites should be made readily available to potential investors.

3. Markets which will ensure an economically acceptable net mill sales return should be identified as an inducement to industry to establish poplar-based manufacturing units in Alberta. This identification should include both national and international markets and should extend to the degree of securing preliminary sales agreements.

4. If the government of Alberta decides to increase its participation in encouraging industrial development, the mechanism or agency necessary to assist potential investors in obtaining the myriad licenses, permits, and clearances from the various provincial and federal regulatory agencies should be established. This agency should also be able to assist in every aspect of project development such as raw material, energy, labour, site, transport, and other elements of development which must be considered by a potential investor.

PART I - PANEL PRODUCTS INDUSTRY

INTRODUCTION

At present, the wood-based panel products family is made up of the following members [1]:

1. Veneer
2. Plywood
3. Waferboard
4. Particleboard
5. Hardboard
6. Softboard
7. Medium Density Fibreboard (MDF)
8. Oriented Strand Board (OSB)
9. Laminated Veneer Lumber (LVL)

There are several sub-types within each product group but discussions in this report have been confined to trends and developments for the major product groups only. Of the foregoing, the two types least well established are LVL and OSB. Both of these products, however, have been manufactured on a trial commercial basis from poplar species and are included in the discussions. As an aid to clarity and brevity, the family of panel products has been segregrated into its natural end-use categories for discussion in this report.

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1. A detailed description of each of these products is contained in Appendix 3.

INTRODUCTION (cont'd)

This natural categorization is shown:

Structural Application

- Plywood
- Waferboard
- Oriented Strand Board

Non-Structural Application

- Particleboard
- Hardboard
- Softboard
- Medium Density Fibreboard

Specialty Products

- Laminated Veneer Lumber
- Veneer

Although overlap in end-use certainly does occur, in general, product usage falls within the above categories. Each of these end-use categories is discussed separately in succeeding sections.

To the present time, production of panels in Alberta has been relatively minor, representing perhaps 5% of the Canadian total, and in an average year markets have been found fairly readily for this modest outturn, a substantial proportion of which has been shipped to markets within Canada. To support a significant increase in wood-based panel production in Alberta, however, the development of export markets - the United States and overseas - would undoubtedly become mandatory.

INTRODUCTION (cont'd)

Primarily for this reason but also because world trade in certain panel products is steadily increasing, a review of world production, consumption and trade trends relative to wood-based products is considered an essential part of this analysis and is included in the following sections. Before proceeding with a discussion of individual panel types, a summary of overall wood-based panel trends relative to lumber, the principal competitive material, is shown in Table 1 and in Graphic form on the following page.

TABLE 1

WORLD PRODUCTION OF WOOD-BASED PANELS & SAWNWOOD

(million m^3)

Product	1950	1960	1970	1975	1979
Veneer	-	1.2	3.4	3.8	4.5
Plywood	6.10	15.3	32.7	34.2	43.2
Particleboard	0.02	3.1	19.3	30.8	41.0
Fibreboard	5.40	9.5	14.4	15.8	17.9
Sub-Total	11.52	29.1	69.8	84.6	106.6
Sawnwood	265.4	343.7	412.6	402.0	446.9
TOTAL	276.92	372.8	482.4	486.6	553.5

Source: FAO [1] Yearbook of Forest Statistics 1960 & 1979.

Note: In general, units used to develop the graphs and tables shown throughout this report have not been standardized but have been used in the original reported form. Conversion to standardized units was not considered necessary since relative trends are of more interest to this study than are absolute values. Where essential for the purpose of this study, however, units have been converted to the more familiar (and still most commonly used) imperial units. A listing of conversion units is contained in Appendix 1.

1. Food and Agriculture Organization of the United Nations. For this and other terms and abbreviations used throughout this report see Appendix 1.

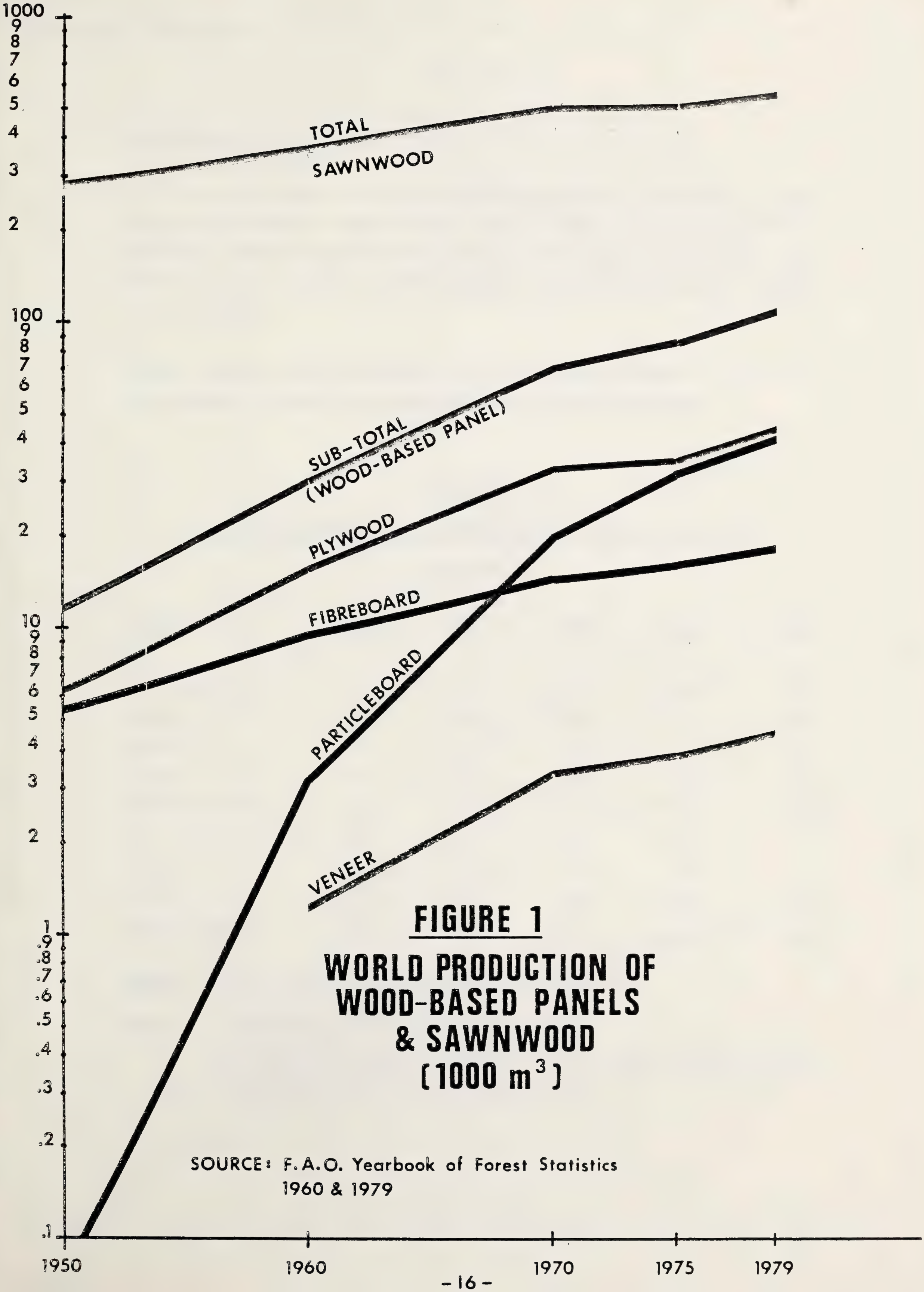


FIGURE 1

WORLD PRODUCTION OF WOOD-BASED PANELS & SAWNWOOD (1000 m^3)

SOURCE: F.A.O. Yearbook of Forest Statistics 1960 & 1979

INTRODUCTION (cont'd)

Over the period shown, the average rate of increase in production of panel products amounted to approximately 8% per year compared to 2.4% for sawnwood. Within the panel products family, particleboard has enjoyed the most dramatic growth rate and in 1979 production of particleboard almost equalled that of plywood.

Regional trends in world panelboard production are also of interest to this study and are shown in Table 2 and in graphic form on the following pages.

TABLE 2

REGIONAL PRODUCTION - WOOD-BASED PANEL PRODUCTS

(million m^3)

Region	1950	1960	1970	1975	1979
North America	7.4	14.8	26.3	28.7	37.2
Europe	2.6	8.8	22.0	28.6	34.7
Japan	0.2	1.6	8.5	7.6	10.2
U.S.S.R.	0.7	2.0	6.0	9.2	10.3
Asia (Less Japan)	0.1	0.8	3.3	5.7	8.8
Latin America	0.2	0.5	2.1	2.8	3.4
Africa	0.1	0.3	0.8	1.0	1.1
Oceania	0.1	0.4	0.8	0.9	1.1
WORLD TOTAL	11.5	29.2	69.8	84.8	106.8

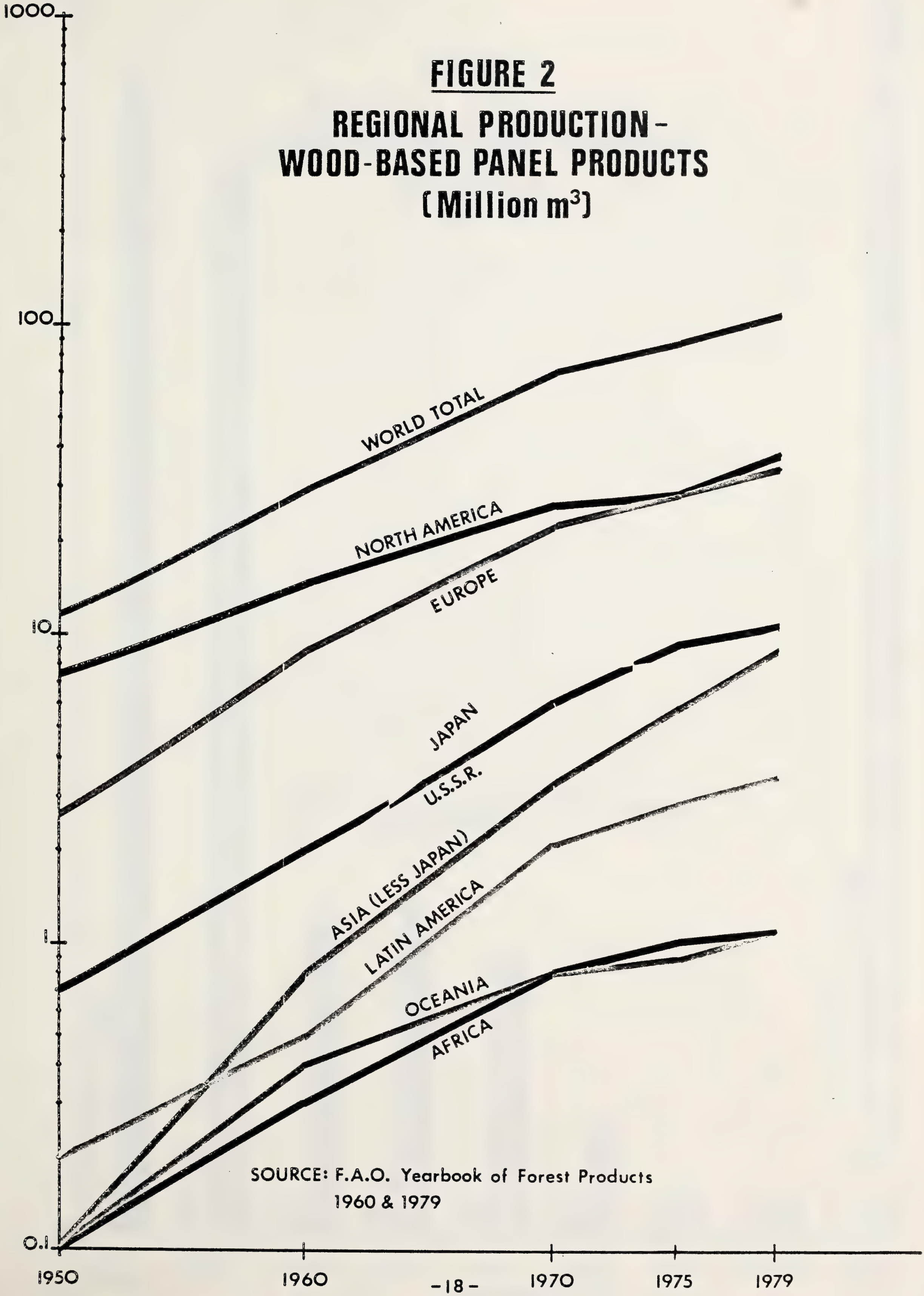
Source: FAO Yearbook of Forest Products 1969 and 1979.

Note: Numbers do not always add due to rounding.

Semi-Logarithmic graphs have been used in order to accommodate the range of volumes shown and in order to show rates of growth trends rather than absolute growth trends.

FIGURE 2

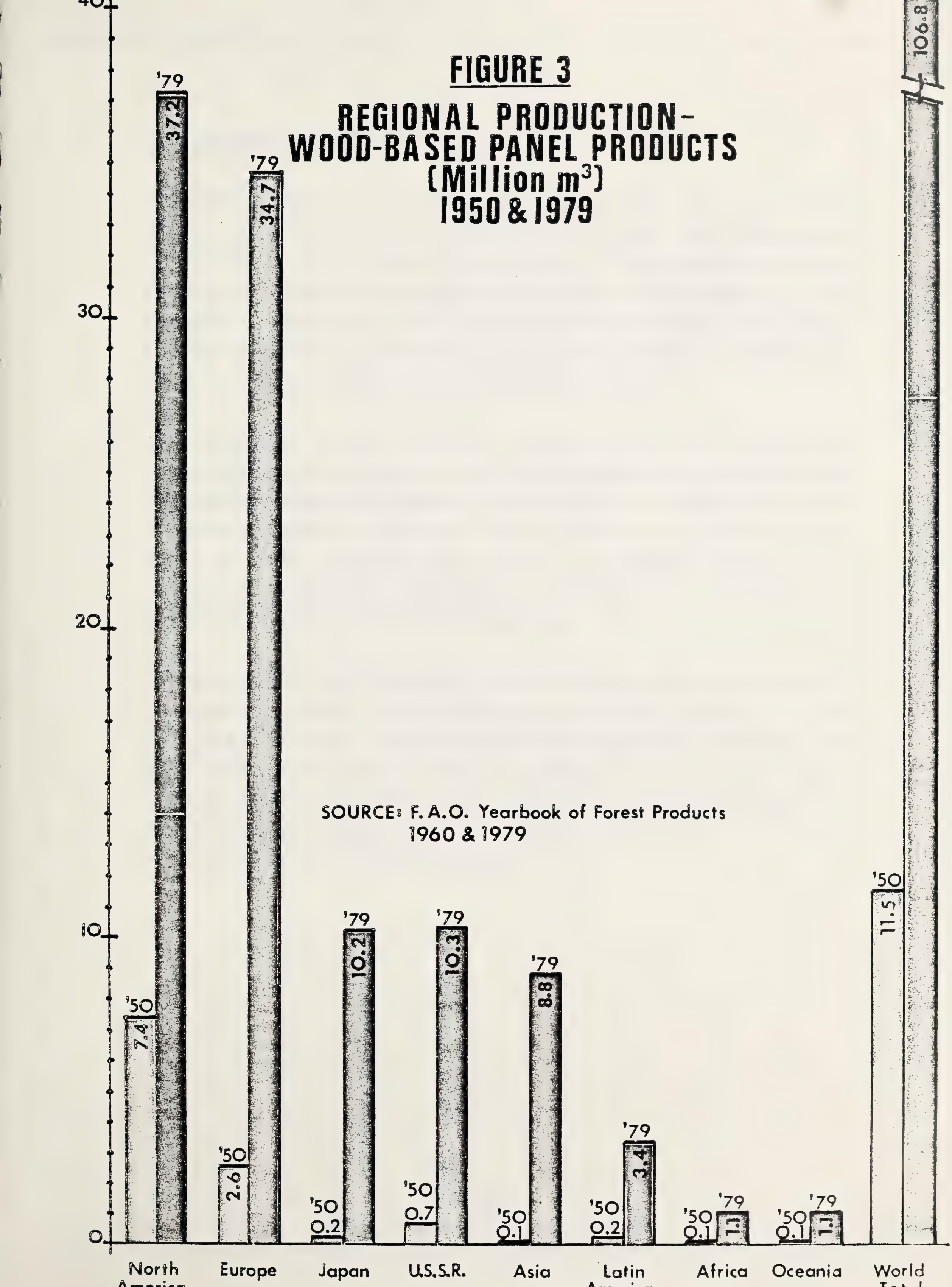
REGIONAL PRODUCTION - WOOD-BASED PANEL PRODUCTS (Million m^3)



SOURCE: F.A.O. Yearbook of Forest Products
1960 & 1979

FIGURE 3

REGIONAL PRODUCTION–WOOD-BASED PANEL PRODUCTS (Million m³) 1950 & 1979



INTRODUCTION (cont'd)

The declining share of world production taken by North America is clearly evident. In 1950 North America accounted for 64% of total world production but for only 35% by 1979. Japan and the remainder of Asia enjoyed the strongest growth rates, accounting for approximately 18% of total production in 1979 compared to less than 1% in 1950. As will be shown later, production in Japan is expected to stabilize, if not decline, while Asian (Philippines, Indonesia and Malaysia primarily) forests are approaching maximum yield.

The implications of these trends for Alberta is that panel products will undoubtedly continue to grow at a much greater rate than sawnwood and that the reconstituted members (particleboards and fiberboards) of the panelboard family will steadily increase in importance. These conclusions are important to Alberta in that the poplar resource has been proven to be technically suitable for the manufacture of any of the reconstituted wood panels but is not particularly suitable for the production of lumber or plywood.

Further details of world panelboard production developments are contained in the appropriate section - structural, non-structural and specialty - of the succeeding discussions. A detailed analysis of the present North American wood-based panel products capacity and the relationship between panel types is presented in Appendix 6. The material in Appendix 6 is considered to be relevant to this report but not critical to a clear understanding of overall industry trends which are identified in the body of the report.

STRUCTURAL PANELS

Production

This category includes those panels used for general construction or other utilitarian purpose in which strength and the ability to withstand exterior climatic conditions are the primary requisites. This in turn requires a water-proof adhesive (generally phenol-formaldehyde) as the binding agent and the qualifying products are: softwood plywood, minor volumes of poplar plywood and other hardwoods, waferboard and OSB. These products compete with one another for the same end-uses and in general also compete directly with sawnwood.

Waferboard and OSB will be treated as if one product since OSB is as yet virtually unknown in the market place, raw materials, mostly poplar, and production techniques are similar for both, and markets for both will be obtained largely at the expense of structural grade plywood.

The two major products - softwood plywood and waferboard - are almost exclusively a North American development and production is confined almost exclusively to North America. Therefore the North American growth rate for these products as shown in Table 3 is for all practical purposes the world growth rate. For waferboard this is completely the case.

TABLE 3

NORTH AMERICA

PRODUCTION OF SOFTWOOD PLYWOOD & WAFERBOARD

(million sq.ft. - 3/8")

	United States		Canada		Total	
Year	Plywood	Waferboard	Plywood	Waferboard	Plywood	Waferboard
1950	2,554	n/a	300	n/a	2,854	n/a
1960	7,816	n/a	1,100	n/a	8,916	n/a
1970	14,340	n/a	1,880	65	16,220	65
1975	16,100	50	2,054	310	18,154	360
1978	19,200	60	2,924	511	22,124	571
1979	18,700	260	2,736	645	21,436	905
1980	17,600	330	2,531	618	20,131	948

Source: American Plywood Association - Statistics Canada.
Industry estimates for some years of waferboard production.

Note: N/A means insignificant.

Production (cont'd)

In the period 1950-1960 North America softwood plywood production increased at a rate of approximately 12% per year. Over the following decade this declined to 6% and during the last decade (1970-80) declined even further to an average rate of 2.2%. Waferboard, which has been commercially produced since the early 1960's did not become an important commodity until the mid-1970's. From that point on, however, the rate of growth of both actual production and of installed capacity has been dramatic. Present (end 1981) installed capacity in Canada and the US. amounts to approximately 2.2 billion sq.ft. - 3/8" basis and will amount to almost 2.9 billion sq.ft. - 3/8" by the end of 1982. In this context, however, it is important to note that in all probability very few, if any, new softwood plywood plants will be built in North America.

This disinterest in expanding plywood production capacity is directly attributable to plywood production costs which are high relative to those for waferboard. Escalating costs of peeler logs combined with low recovery of marketable plywood from peelers are the principal reasons for this imbalance which is expected to increase sharply.

Despite the dramatic expansion in waferboard production capacity, the additional volumes contributed by this expansion to the total structural panelboard capacity is relatively minor. In fact, the total waferboard capacity-including plants under construction - will amount to only 10% of the installed structural panelboard capacity. To provide additional perspective it is worth noting that between 1950 and 1970 the rate of growth of production capacity amounted to the equivalent of approximately nine international scale (72 million 3/8") plywood plants per year. Since 1970 the rate of growth has declined to approximately seven new plants per year but even this modest growth rate represents very substantial volume increases.

These are important considerations for Alberta, since, as noted, the poplar resource is not well-suited to plywood production but is ideally suited for waferboard manufacture.

Production (cont'd)

Confirmation of the growing importance of waferboard was provided during interviews with industry representatives. The unanimous opinion expressed was that waferboard (or a similar type panel) would eventually replace plywood as the major structural panel in North America and, later, internationally. The rate of this displacement is estimated to be directly related to the price differential between plywood and waferboard. As will be shown later, this differential is expected to increase sharply over the next decade or so.

Consumption

General consumption trends are a reflection of general production trends which have already been discussed. From Alberta's viewpoint, regional consumption trends, national and international, are of greater interest and these will be briefly analysed in this section.

World trends in consumption of all wood-based panels are shown by major world region in Table 4, and further illustrated by the chart on the following page.

TABLE 4

WORLD CONSUMPTION OF WOOD-BASED PANELS BY REGION

(million m^3)

Region	1950	1960	1970	1975	1979
North America	7.4	15.2	28.2	29.2	39.6
Europe	2.6	8.5	23.1	29.9	36.1
Japan	0.2	1.2	8.3	10.2	10.7
U.S.S.R.	0.8	2.0	5.5	8.4	9.5
Asia (Less Japan)	0.1	0.7	1.5	2.5	5.7
Latin America	0.2	0.6	2.0	2.7	3.4
Africa	0.1	0.3	0.7	1.1	1.1
Oceania	0.2	0.4	0.8	0.4	1.1
WORLD TOTAL	11.6	28.9	70.1	84.4	107.2

Source: FAO Worldbook of Forest Products, 1969 and 1979.

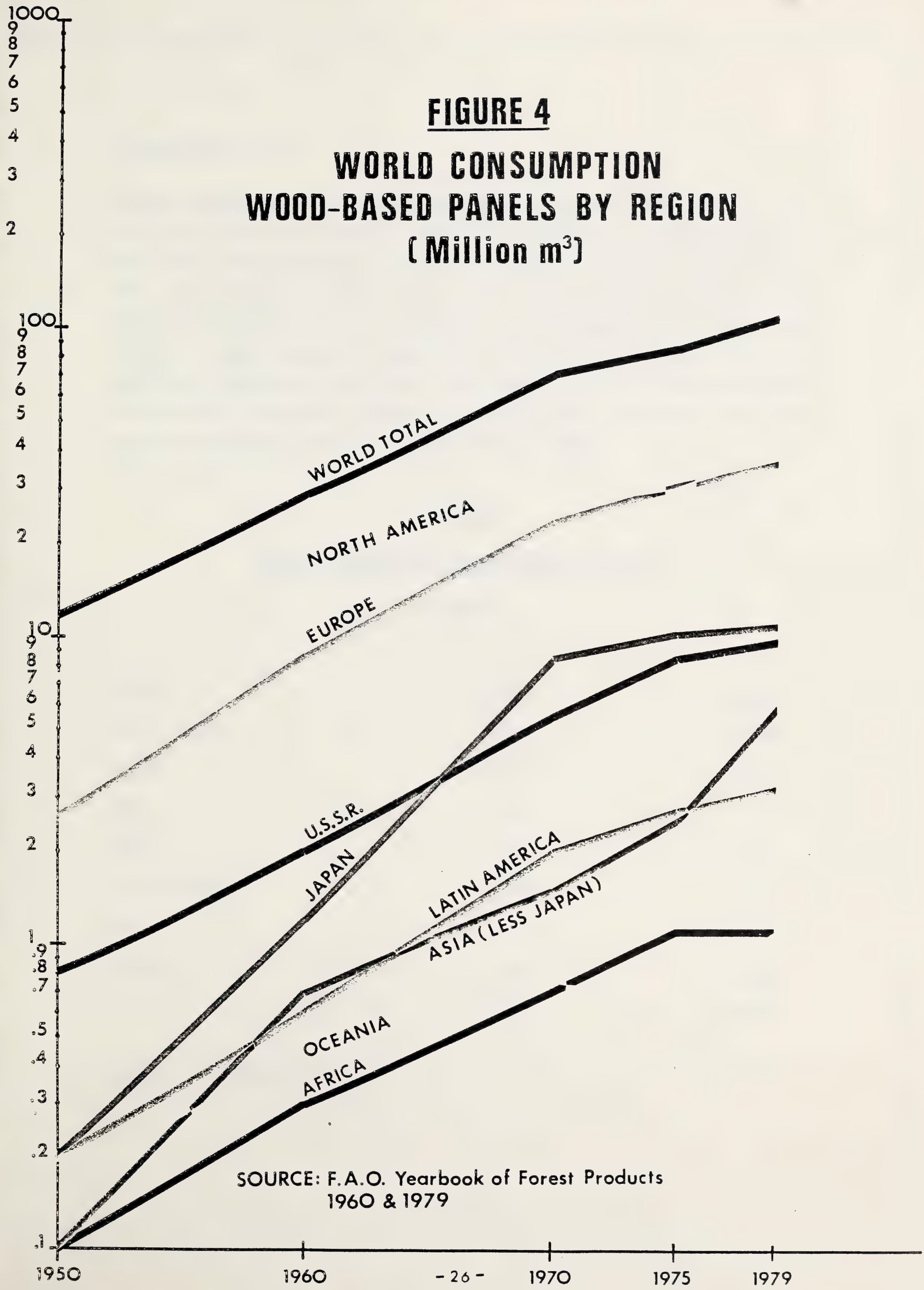


FIGURE 4
WORLD CONSUMPTION
WOOD-BASED PANELS BY REGION
(Million m³)
1000
100
10
1
.1
WORLD TOTAL
NORTH AMERICA
EUROPE
U.S.S.R.
JAPAN
LATIN AMERICA
ASIA (LESS JAPAN)
OCEANIA
AFRICA
SOURCE: F.A.O. Yearbook of Forest Products
1960 & 1979
1950
1960
1970
1975
1979

Consumption (cont'd)

Despite strong growth rates the decline in share of World consumption accounted for by North America is clearly evident. In 1950 North America accounted for over 63% of World consumption but by 1979 this had declined to approximately 37%. The important conclusion to be drawn from the data in Table 4 is the increasing importance of all other regions as consuming areas. In other words, the use of panel products is becoming much more wide-spread. This is a significant consideration for Alberta since many of the major consuming areas are becoming increasingly reliant on imported forest products of all types including panelboards. This trend is illustrated in Table 5.

TABLE 5

REGIONAL IMPORTS WOOD-BASED PANELS

($1,000\ m^3$)

Region	1970	1979
North America	2,724	3,560
Europe	5,913	10,731
Japan	291	79
USSR	87	110
Asia (less Japan)	239	1,388
Africa	221	320
Oceania	98	92
	9,692	16,514

Source: FAO yearbook - 1979.

Consumption (cont'd)

Closer examination would reveal that a major portion of the above trade occurred intra-regionally, ie. from country to country within the same region but most of the traditional supply sources (from Scandinavia to Europe, for example) are experiencing increasing scarcities of economically available wood fibre. Canadian producers have relied on export sales for up to 25% of their softwood plywood shipments and 60% of waferboard sales although the current recession has reduced these ratios to 18% and 40% respectively.

Trends in consumption of structural panels within Canada are illustrated by the data in Table 6 which shows softwood plywood shipments for 1968 and 1980.

TABLE 6

DISTRIBUTION OF CANADIAN SOFTWOOD PLYWOOD SHIPMENTS [1]

1968 & 1981

(1,000 sq.ft. - 3/8")

Region To	1968		1981	
	Volume	%	Volume	%
Atlantic	71,612	4.7	108,516	5.5
Quebec	294,182	19.3	326,460	16.6
Ontario	465,744	30.7	419,827	21.4
Manitoba	91,828	6.1	99,933	5.1
Saskatchwan	79,793	5.3	111,483	5.7
Alberta	214,446	14.1	430,367	21.9
British Columbia (incl. Yukon & N.W.T.)	300,904	19.8	467,778	23.8
Total Domestic Shipments	1,518,509	100.0	1,964,004	100.0

	Volume	% of Total Shipments	Volume	% of Total Shipments
Exports	476,151	24.0	420,543	17.6
Domestic Shipments	1,518,509	76.0	1,964,004	82.4
Total Shipments	1,994,660	100.0	2,384,547	100.0

Source: Statistics Canada Catalogue 35-001.

1. Exterior type poplar plywood included. Estimated about 60 million sq.ft. in 1981.

Consumption (cont'd)

In 1968 Ontario and Quebec accounted for over 50% of the total shipments of softwood plywood to the Canadian market but by 1981 the proportion had declined to 38%. Over the same period, shipments (consumption) to Alberta and British Columbia rose from 34 to 46%. This increase in Western consumption may be attributed to above average industrial expansion and the consequent increase in housing starts in these Provinces. A list of Canadian and U.S. waferboard plants is contained in Appendix 4 but in summary, all waferboard is produced closer to the major markets in eastern Canada than is most softwood plywood. This proximity to market and resultant lower transportation costs (which more than compensate for waferboard's higher density) plus lower cost of production has made waferboard an economically acceptable substitute for softwood plywood in nearly all bulk end-use markets. Waferboard exports, however, have consistently constituted a much higher proportion of total sales than plywood and in an average year about 50% of waferboard shipments are made to the United States. Of the remainder, 35 - 40% is used in Eastern Canada and the balance in Western Canada.

Minor volumes of waferboard have been exported to Western Europe but to date overseas market acceptance is very limited. There is no doubt that the sharp increase in waferboard productive capacity (25%) which is expected by early 1983 will have an adverse effect on Canadian sales to the U.S. The extent of the negative effect is difficult to estimate because even though most U.S. plants are closer to the major U.S. markets and a 7.75% tariff rate exists, the current exchange rate tends to balance out these disadvantages to Canadian producers.

The rate of displacement of plywood by waferboard will of course be a function of many variables and one of the most important is price which in turn is heavily influenced by cost of production. As will be shown in the discussion on price immediately following, one recognized research agency forecasts that by 1990 the cost of producing structural grade plywood will be more than double that of waferboard.

Price

Traditionally, waferboard has been priced 10 to 20% below structural grade plywood. This relationship reflects, to a degree, the relative costs of production and the necessity for a new product (waferboard) to "buy" into established markets. For the purposes of this study, a detailed analysis of prices by grade, species, volume and all of the other daily trading considerations are not critically important but the probable future general price relationships are of primary importance since these relationships will of course greatly affect future relative levels of demand.

Net mill selling prices for softwood plywood, and waferboard are shown in Table 6A from 1976 to 1981. These are shown graphically in Figure 5 which also shows cost relationships projected [1] to 1995.

1. Projections developed by Data Research Incorporated (D.R.I.), a recognized research agency.

TABLE 6A

STRUCTURAL PANELS - PRICE TRENDS

($/MSF 3/8")

Year	Softwood Plywood	Waferboard
1976	135	115
1977	137	123
1978	168	142
1979	173	147
1980	185	121
1981	190	138

Source: Madisons Timber Reporter Statistics Canada.

Note: Above prices are net FOB producing mill. Softwood plywood includes only structural grade CSP quality; i.e., no Douglas Fir sheathing included.

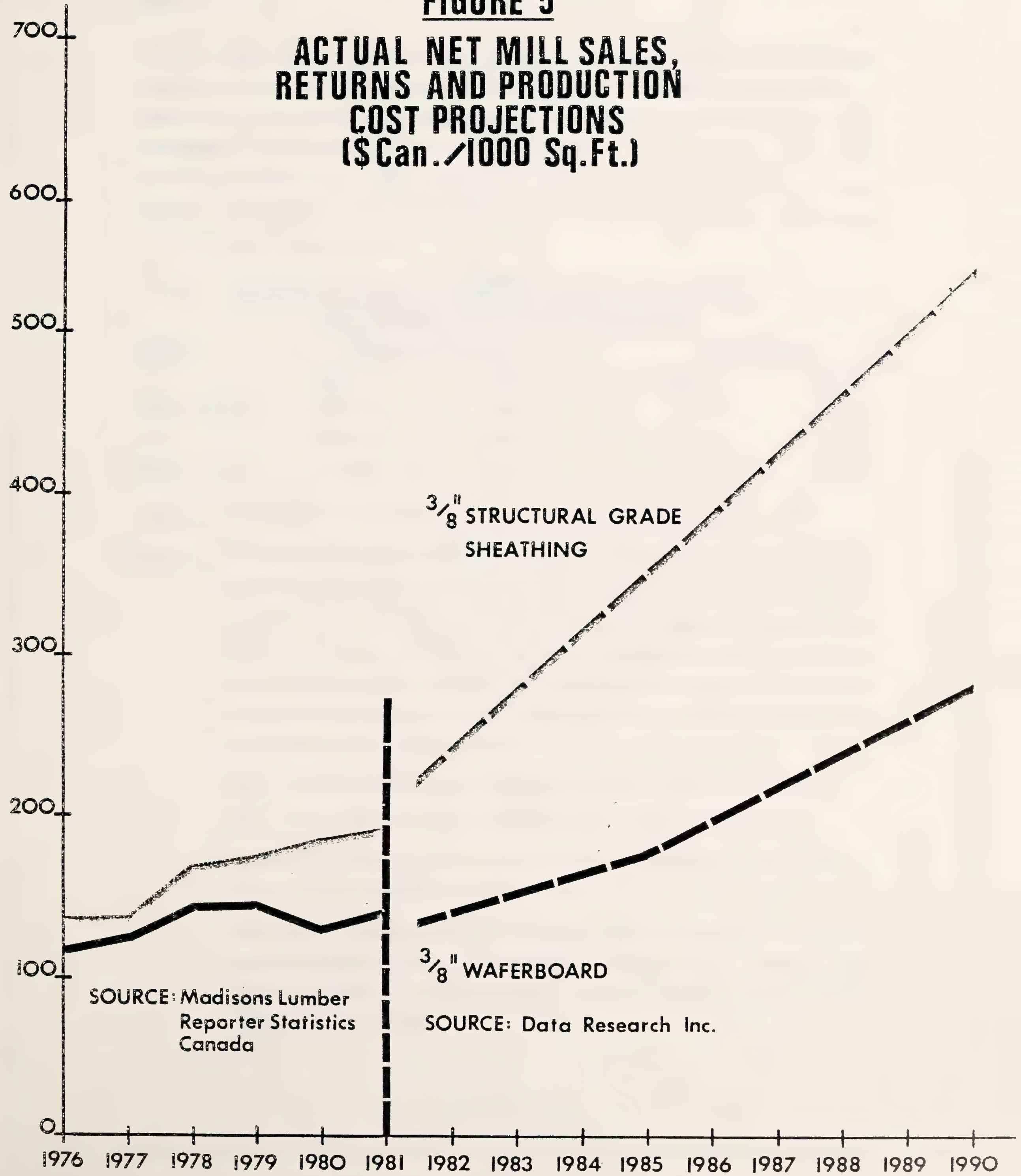
Price (cont'd)

Despite the uncertainties inherent in all projection techniques, C-H considers the conclusions reached by DRI to be reasonably accurate. Unless completely unpredictable circumstances occur during the next decade or so, factors such as log quality and cost, panel recovery ratios, labour and chemical additives content will all tend to increase the existing gap between plywood and waferboard production costs. Whether this difference will amount to 50% or 100% by 1990 is not critical. What is critical, however, is that a substantial cost difference will certainly exist and this factor should expedite displacement of plywood by waferboard.

In the opinion of the majority of interviewees familiar with both plywood and waferboard, there are very few general construction end-uses for which the two products are not inter-changeable and the ultimate decision as to which is used will be governed entirely by price. It seems reasonable to conclude therefore that demand for waferboard (or a similar product) will increase sharply in the near future and that this increase will occur at the expense of structural grade softwood plywood.

FIGURE 5

ACTUAL NET MILL SALES, RETURNS AND PRODUCTION COST PROJECTIONS ($Can./1000 Sq.Ft.)



Tariffs

Tariffs are applied by the principal importers - the United States, the European Economic Community and Japan. These restraints are important factors in establishing the price of Canadian panels delivered to these markets and consequently are restraints on sales development. As a member of GATT, Canada has agreed with other member countries to mutually reduce existing tariffs to established minimums by 1988. For softwood plywood and waferboard the following schedule applies.

TABLE 7
PRESENT & FUTURE TARIFFS IN SELECTED MARKETS
SOFTWOOD PLYWOOD & WAFERBOARD

Region	Softwood Plywood		Waferboard	
	1982	1988	1981	1988
United States	20%	20%	8.5%	4%
EEC	Free	Free	11.5%	10%
Japan	15%	15%	18%	12%

Source: Government of Canada. Multilateral Trade Negotiations - 1979.

Note: "Free" entry for softwood plywood into EEC member countries means coniferous plywood may enter without duty up to the level of an annual quota, established by the EEC, which generally ranges from 600,000 m^3 up to 700,000 m^3 in total. Under the GATT the quota cannot be less than 600,000 m^3. The amount of the annual quota varies with individual member countries and also relates to specific thicknesses and types of plywood:

(a) coniferous plywood, unsanded, thicker than 8.5 mm (3/8").

(b) coniferous plywood, sanded, thicker than 18.5 mm (3/4").

Coniferous plywoods less than the above thicknesses would face a duty of 12% - declining to 10% by 1988.

The United States tariff on waferboard will be reduced to the 4% level in equal annual installments from 1982 onward. The EEC and Japanese tariffs on waferboard are similarly reduced in equal annual installments up to 1988.

Tariffs (cont'd)

It is apparent that waferboard, except into the EEC, will be less affected by tariffs than plywood. At the moment, waferboard is classified as particleboard in nearly all regions and the tariffs shown reflect this classification. Canada has made overtures to reduce EEC tariff on waferboard and/or obtain a duty free quota to no avail. The very large production capacity for particleboard in Europe has prevented successful negotiations.

Although quotas do not exist in the Japanese market, in effect Japanese quality standards and building systems act as a deterrent to softwood plywood imports. Panel test methods have been established based on hardwood plywood characteristics and these tests are almost impossible for softwood plywood to meet. However, discussions with Japanese authorities indicate some modifications to the standards may be adopted. Demonstration homes are being built in Japan based on Canadian timber - frame construction methods. These are, apparently, proving useful in developing markets.

In summary, although tariffs must be taken into consideration in developing market plans for any expanded panelboard production undertaken in Alberta, the tariffs are not considered high enough to act as a serious sales deterrent. This has been demonstrated by long-term plywood sales to all export markets. Recently, trial shipments of waferboard to the EEC and Japan have been made and the material has received a cautious degree of acceptance. Somewhat surprisingly, waferboard has gained some acceptance in Europe as a semi-decorative panel, although the marketing strategy has been designed for structural uses.

Transportation

A detailed analysis of transportation cost considerations is presented in Part III of this report and will not be repeated here. Briefly, however, the cost of transportation to market has always had a major impact on the distribution of all forest products. Since the "oil crisis" the impact has increased in severity and transportation costs are now exerting and will continue to exert a strong influence on the establishment of distribution patterns for all panel products.

As an example of the effect of transportation costs on relatively low-value items such as panel products, MDF - which is not manufactured in Canada -flows from the North West U.S. to furniture producers in the Toronto/Montreal area and transportation costs are in excess of 100% of the mill selling price increasing the delivered cost of 1,000 sq.ft. of 5/8" to approximately $420.00 Canadian from a mill net price of $220.00 U.S. However, as noted, an in-depth analysis of transportation costs in general and the relationship of those costs with Alberta's location is contained in Part III therefore will not be discussed further here.

Future Demand

In this section, various demand projections as developed by recognized research organizations are discussed, and, based on these projections modified by C-H's research, estimates of plywood and waferboard demand to 1995 for the U.S. and Canada have been prepared.

Table 8 summarizes demand projections for the U.S. as developed by four reputable agencies. Only one of these agencies has developed separate estimates for waferboard.

TABLE 8

DEMAND PROJECTIONS - STRUCTURAL PANELS - UNITED STATES

(billion sq.ft. - 3/8")

D.R.I.				S.R.I.		F.A.O.		U.S.F.S.	
Year	Plywood	Wafer-board	Total	Year	Total	Year	Total	Year	Total
1977	18.4	0.2	20.4	1977	19.1	1975	20.0	1976	17.2
1982	17.3	1.6	18.9	1985	20.5	1984	40.7		
1987	18.1	5.0	23.1	1990	21.0			1990	23.7
1992	16.2	8.1	24.3	1995	24.1	1994	71.0	2000	24.2
Average Annual Rate of change:									
	(-)1%	(+)28%	(+)1.2%		(+)1.3%		(+)9%		(+)1.5%

Source:

D.R.I. - Data Resources Inc. Report, October, 1981.

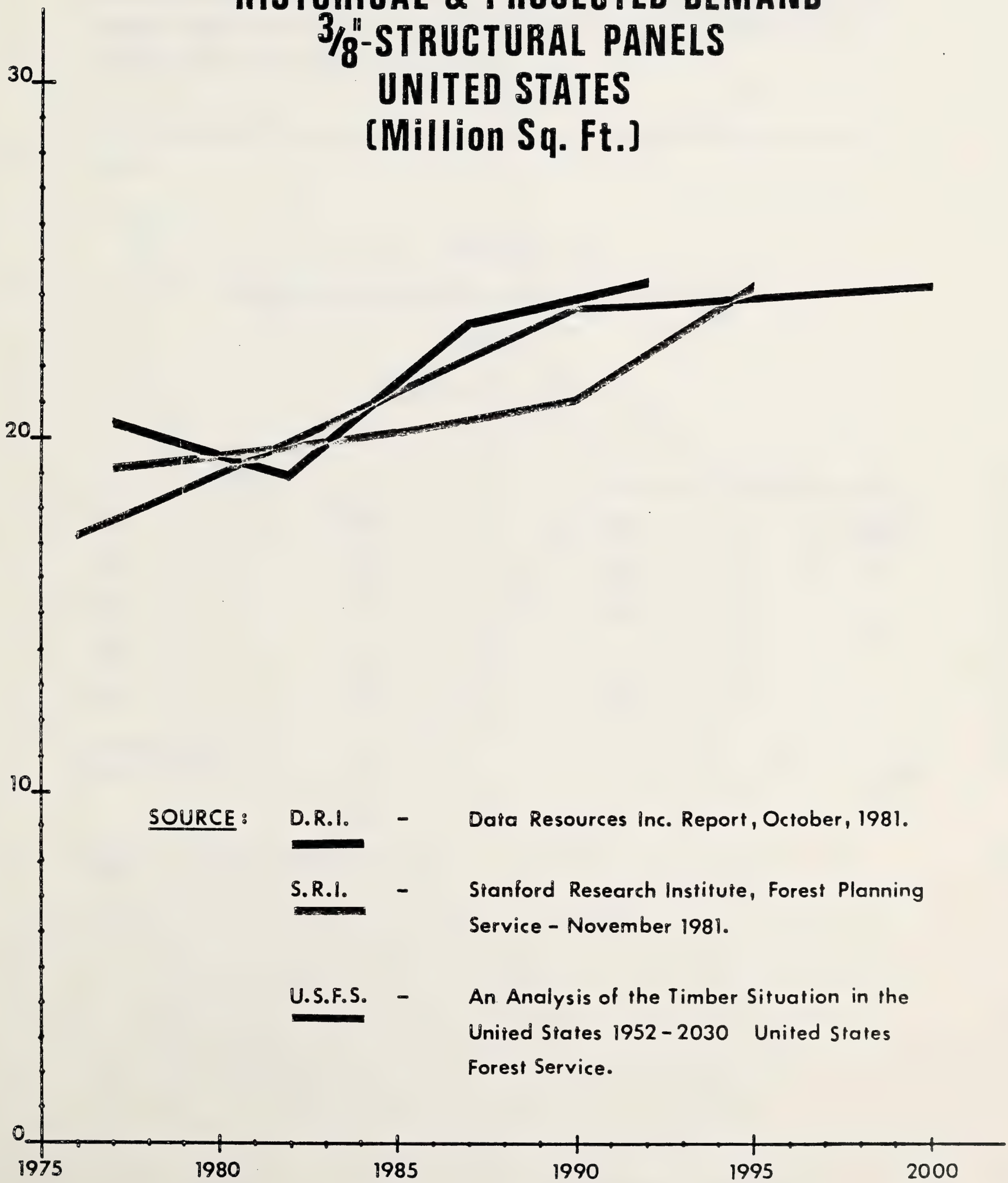
S.R.I. - Stanford Research Institute, Forest Planning Service - November 1981.

F.A.O. - Food & Agriculture Organization of the United Nations. Projections of Consumption of Industrial Forest Products - 1978.

U.S.F.S. - An Analysis of the Timber Situation in the United States 1952 - 2030 - United States Forest Service.

FIGURE 6

HISTORICAL & PROJECTED DEMAND
3/8"-STRUCTURAL PANELS
UNITED STATES
(Million Sq. Ft.)



Future Demand (cont'd)

Except for FAO, there appears to be a remarkable similarity in the anticipated average annual growth rates. The FAO projections are considered to be unrealistically high and should be ignored.

Only two agencies have developed projections for Canada and these are shown in Table 9.

TABLE 9

DEMAND PROJECTIONS - STRUCTURAL PANELS

CANADA

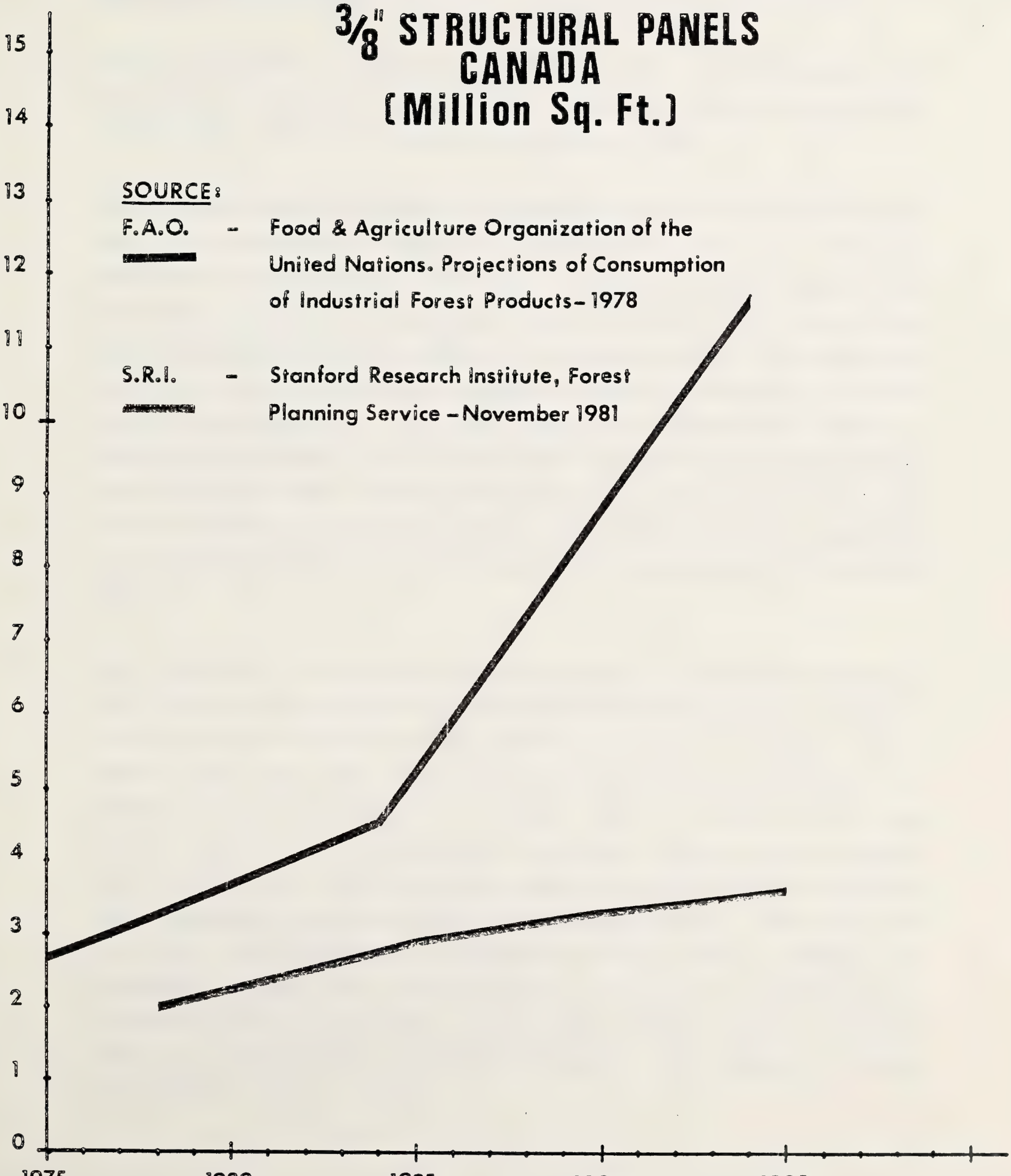
(billion sq.ft. - 3/8")

S.R.I.		F.A.O.	
Year	Total	Year	Total
1978	2.0	1975	2.7
1985	2.9	1984	4.5
1990	3.3		
1995	3.6	1994	11.7
Average Annual Rate of Growth	3.5%		8.0%

Source: Refer to Table 8.

FIGURE 7

HISTORICAL & PROJECTED DEMAND
3/8" STRUCTURAL PANELS
CANADA
(Million Sq. Ft.)



Future Demand (cont'd)

As with projections for the U.S., the FAO estimates appear to be unreasonably high and should be ignored.

Actual consumption in Canada during the period 1950 - 1960 increased at the rate of approximately 12.2% per year. This declined to 5.0% in the decade 1960 - 1970 and from 1970 to 1981 declined even further to 3.9%.

The high growth rates experienced in the period prior to 1970 resulted primarily from the displacement of lumber by plywood and by the early 1970's this displacement had reached a maximum. Structural panels (plywood and waferboard principally) will undoubtedly experience growth rates more closely allied with general economic conditions in the future and in C-H's opinion the annual rate of growth over the next decade will decline to between 1 1/2 and 2%. Assuming an average of 1 3/4% per year this increase would amount to approximately 42 million sq.ft. 3/8" per year or approximately half the output of one standard-sized plant. Assuming the same growth rate for the U.S. the total annual increase in demand for plywood and waferboard would amount to approximately 400 million sq.ft. 3/8" per year - the equivalent of 4 additional plants.

Since waferboard will undoubtedly replace plywood to a significant degree in North America and since the U.S. contains substantial stands of low-quality hardwoods, much of which is located closer to the major U.S. markets than is Alberta's poplar and is also technically suitable for waferboard production, the likelihood of developing long-term markets in the U.S. appears to be fairly remote. There are additional Canadian sites, east of Alberta, where sufficient poplar and low grade hardwoods are available to support several waferboard mills. Waferboard production studies are currently underway in this region and new plants will undoubtedly be constructed when market conditions are favourable. Certainly, over the short-term (5 to 10 years) the conclusion seems inescapable that securing export markets (Japan, Taiwan, Korea or Western Europe) for Alberta-based waferboard producers will become a critical requirement for economic viability.

NON-STRUCTURAL PANELS

Production

Panel products included in this category are particleboard, hardboard, softboard and medium - density fibreboard. Although each product is predominant in many end-uses, overlap does occur to a considerable extent. MDF for example, competes for the same markets as particleboard, which in turn competes with certain grades of hardboard in markets for thinner panels - 3/8" and less.

In a previous section it was shown that, on a world basis, production of particleboard grew at a much greater rate than the other panel products but fibreboard (hardboard and softboard) enjoyed only modest growth rates. These trends also apply to North America as shown by the graph on the following page. Production data for MDF, a relatively new panel product, has been included in the data for particleboard.

Commercial production of MDF has until very recently been confined to the U.S. and the growth rate of this product is compared with that of U.S. produced particleboard in Table 10.

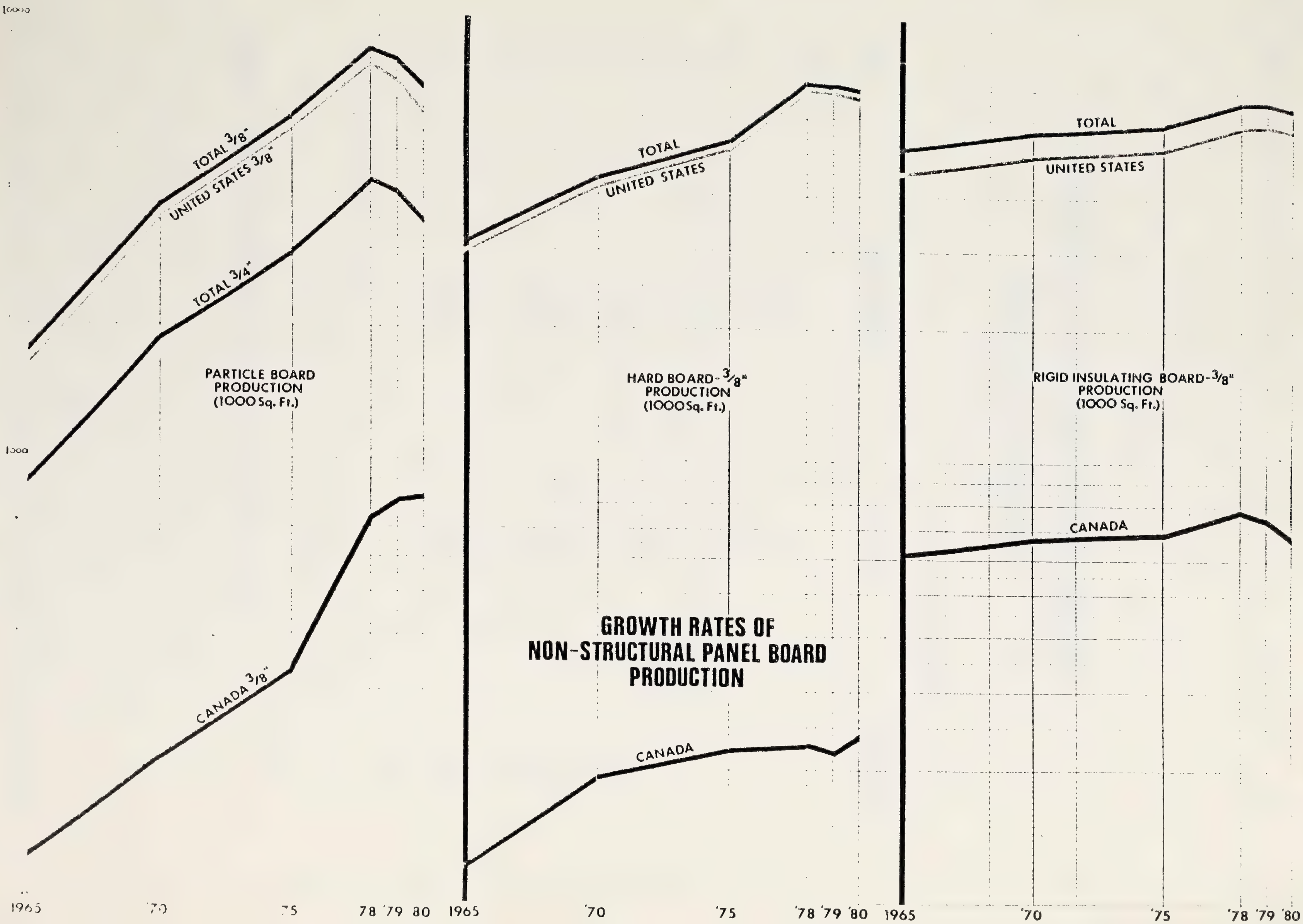

GROWTH RATES OF
NON-STRUCTURAL PANEL BOARD
PRODUCTION
PARTICLE BOARD
PRODUCTION
(1000 Sq. Ft.)
TOTAL 3/8"
UNITED STATES 3/8"
TOTAL 3/4"
CANADA 3/8"
HARD BOARD-3/8"
PRODUCTION
(1000 Sq. Ft.)
TOTAL
UNITED STATES
CANADA
RIGID INSULATING BOARD-3/8"
PRODUCTION
(1000 Sq. Ft.)
TOTAL
UNITED STATES
CANADA
1965
'70
'75
'78 '79 '80

TABLE 10

PRODUCTION OF PARTICLEBOARD & MEDIUM DENSITY FIBREBOARD - UNITED STATES

(million sq.ft. - 3/4")

Year	Particleboard	MDF Quantity	MDF Percent of Particleboard
1970			
1971	2,394	N/A	
1972	3,116	N/A	
1973	3,494	N/A	
1974	3,104	N/A	
1975	2,539	216	8.5
1976	3,202	280	8.7
1977	3,593	441	12.3
1978	3,869	539	13.9
1979	3,536	534	15.1
1980	3,029	513	17.0
Average Annual Growth Rate:			
	3.7%	18.9%	

Source: National Particleboard Association - Maryland, U.S.A.

Production (cont'd)

Production of MDF has grown markedly both as a percent of particleboard production (MDF's major competitor) and in absolute terms. This increase in production has occurred despite the fact that production costs (thus prices) are considerably higher for MDF than for particleboard. MDF reportedly possesses superior machining, overlaying and direct printing qualities as well as greater dimensional stability than particleboard and these characteristics account for the growth rate in the MDF industry.

Production of hardboard and softboard in Canada has more or less stabilized as shown in Table 11.

TABLE 11

PRODUCTION OF HARDBOARD & SOFTBOARD IN CANADA - SELECTED YEARS

(million sq.ft. - 3/8")

	Hardboard	Softboard
1950	30	302
1960	86	500
1970	200	695
1975	215	645
1978	238	771
1979	234	746
1980	232	583
Average Annual Growth Rate 1970 - 80:	4%	2%

Source: Statistics Canada Catalogues.

Production (cont'd)

It is apparent that neither of the above products have been attractive investment potentials in Canada over the past decade or so. This has been the case world-wide and it is likely that conventional wet-process hardboard production will gradually be phased out in favour of dry process particleboard types. Overall production of softboard which is used for many specialized end-uses such as ceiling tile will probably stabilize but production of the wall sheathing type panel is expected to decline. Competition from products with much higher insulation values such as styrene, styrofoam and polyfoam combined with plywood or waferboard is expected to reduce demand for softboard sheathing. It is noteworthy that two major - sized producers - one in Eastern Canada and one in the U.S. - have recently discontinued production of sheathing boards. The decision to cease production was taken before the present recession occurred.

Neither hardboard nor softboard should be completely ruled out, however, as potentials for manufacture in Alberta since both can be readily produced from aspen and/or poplar.

Consumption

As noted previously, world particleboard consumption has increased at a relatively high annual rate. This is illustrated by trends in the major consuming regions shown in Table 12 and illustrated in the graphs on the page following.

TABLE 12

REGIONAL PARTICLEBOARD CONSUMPTION - SELECTED YEARS

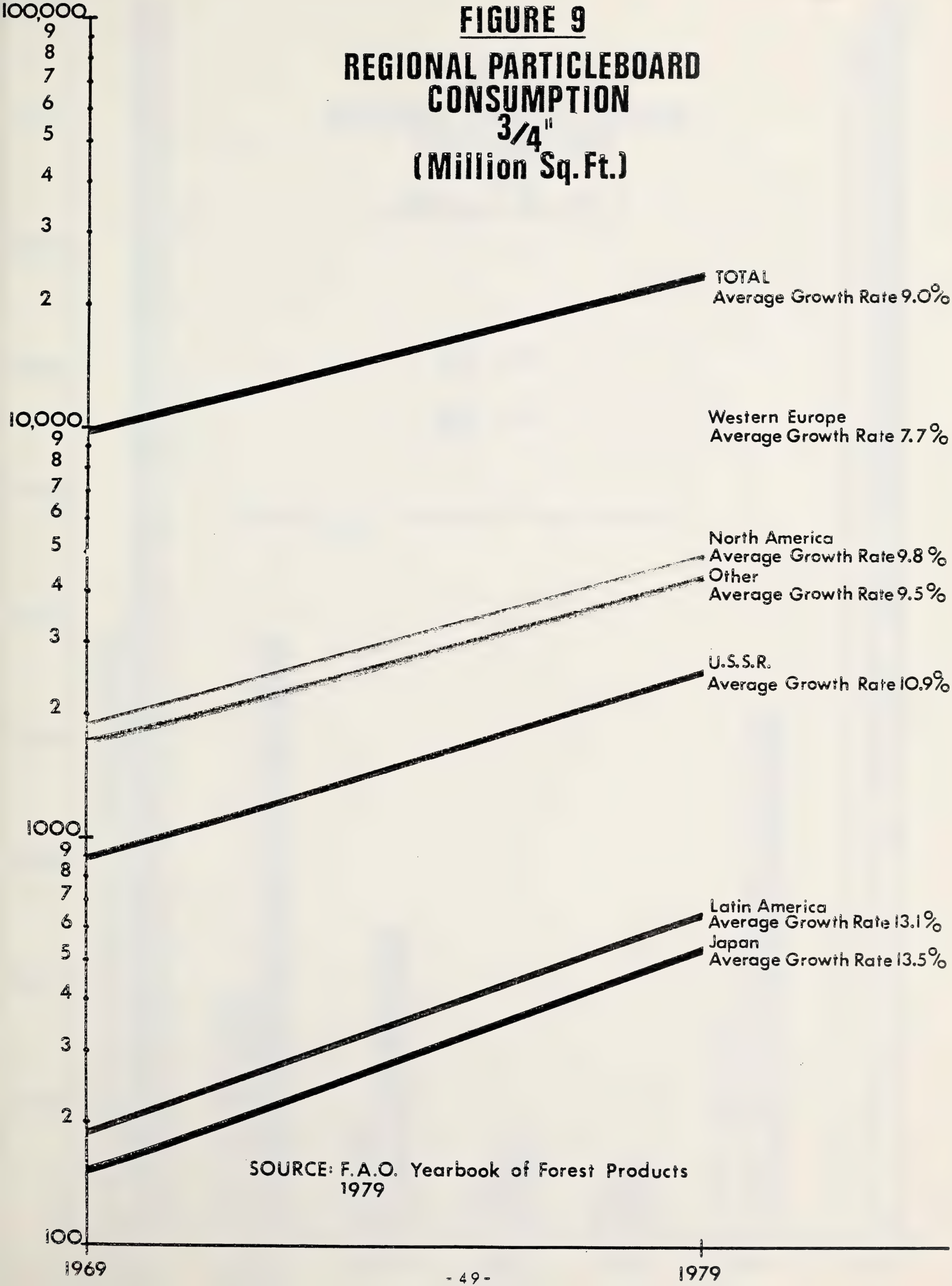
(million sq.ft. - 3/4")

Region	1969 Volume	1969 Percent	1979 Volume	1979 Percent	Average Annual Growth Rate %
Western Europe	4,894	50.2	10,265	44.6	7.7
North America	1,893	19.5	4,803	20.9	9.8
U.S.S.R.	892	9.1	2,502	10.9	10.9
Latin America	190	1.9	648	2.8	13.1
Japan	152	1.6	539	2.3	13.5
Other	1,721	17.7	4,255	18.5	9.5
World Total	9,742	100.0	23,012	100.0	9.0

Source: FAO Yearbook of Forest Products 1979.

FIGURE 9

REGIONAL PARTICLEBOARD CONSUMPTION
3/4"
(Million Sq.Ft.)



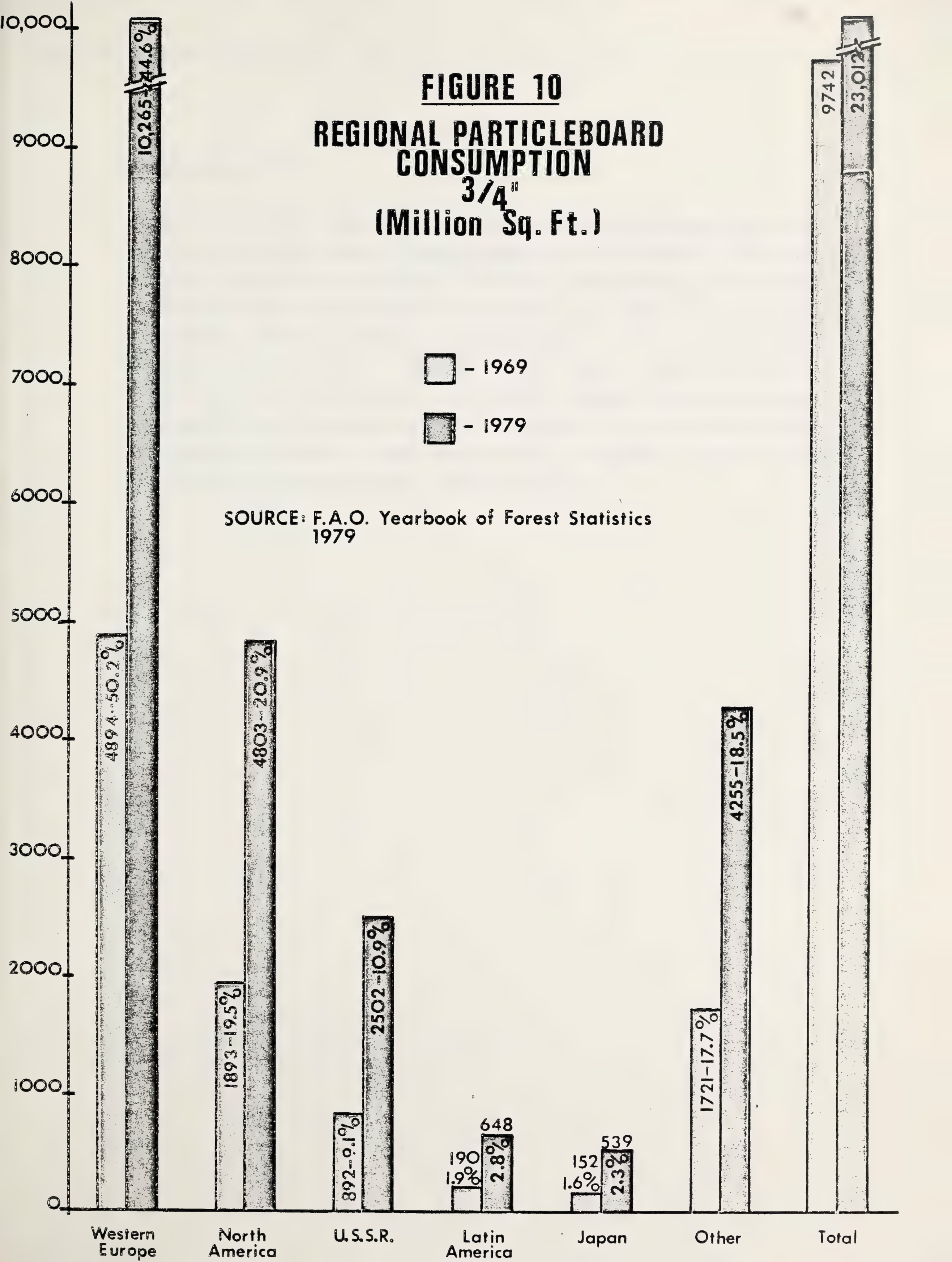


FIGURE 10
REGIONAL PARTICLEBOARD CONSUMPTION
3/4"
(Million Sq. Ft.)
- 1969
- 1979
SOURCE: F.A.O. Yearbook of Forest Statistics 1979
10,000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
4894-50.2%
10,265-44.6%
1893-19.5%
4803-20.9%
892-9.1%
2502-10.9%
190
1.9%
648
2.8%
152
1.6%
539
2.3%
1721-17.7%
4255-18.5%
9742
23,012
Western Europe
North America
U.S.S.R.
Latin America
Japan
Other
Total

Consumption (cont'd)

Despite growth rates relatively lower than most of the remaining regions, the heavily industrialized areas of Western Europe and North America continue to account for more than 66% of the world's particleboard consumption. Particleboard has not been traded inter-regionally to any great extent primarily because of a relatively low value to weight ratio which severly limits economical transport distances but also because particleboard can be manufactured from almost any type of fibrous waste. Most countries develop more than adequate volumes of waste from either agricultural or industrial activity and initiate local particleboard production to meet local demand. The effects of these export trade restraints is demonstrated by the data in Table 13.

TABLE 13

PARTICLEBOARD TRADE FLOWS FOR MAJOR CONSUMING REGIONS - SELECTED YEARS

(million sq.ft. - 3/4")

Region	1969	1979
Western Europe		
EEC	+151	+924
Scandinavia	-101	-440
Other Western Europe	-28	-603
Balance Western Europe	+22	-119
North America [1]		
U.S.	-2	+138
Canada	+27	-161
Balance	+25	-23
Eastern Europe		
U.S.S.R.	-73	-151
Other Eastern Europe	+12	+144
Balance	-61	-7
Latin America	-57	+21
Japan	+15	+3

Source: FAO Yearbook of Forest Products 1979.

Note: + means net imports; -- means net exports.

1. Includes waferboard.

Consumption (cont'd)

Despite the rapid growth in world particleboard consumption, inter-regional world trade did not increase significantly over the decade shown. This is an important consideration relative to potential developments in Alberta since overseas exports would undoubtedly be an essential element in successfully marketing particleboard produced in Alberta. The major domestic markets are located in Quebec and Ontario and excess particleboard capacity is already located in both provinces. In the United States, excess installed capacity for particleboard has been a traditional feature of the industry and will remain so for the forseeable future. This installed capacity is located on a wide-spread basis thus providing the ability to service all major regional markets economically.

Separate trade data for MDF are not readily available but industry sources interviewed report that Canadian imports from the U.S. now amount to approximately 35 million sq.ft. 5/8" basis per year and that the demand is steadily increasing. Japan also imports increasing quantities of MDF, not primarily as a replacement for particleboard or plywood, but rather as a substitute for solid lumber in end-uses such as solid-core doors, window and door frames and even as support columns in non-residential buildings. In Canada and the U.S. (which account for at least 90% of all MDF used) MDF is used almost exclusively as a substitute for other panel products, mainly as a substrate for overlay material such as vinyl or other plastic laminate, for wet print finishes and for cabinet work. The exception is the use of MDF for moulding and window sill, the various profiles for which are gaining wide market acceptance in North America.

Consumption (cont'd)

Analysis of world trade in hardboard reveals a pattern similar to that for particleboard. The exception is that North America now imports substantial volumes from other regions principally Latin America (Brazil, Mexico), and until very recently Poland and Russia also. However, in 1980, Canadian producers obtained a favourable ruling in an anti-dumping action against Eastern European shippers and an immediate surcharge of approximately $60.00 per 1,000 sq.ft. 1/8" basis was imposed on hardboard from Eastern Europe and this extra cost (almost double established prices) has acted as an effective deterrent to hardboard imports from Eastern Europe. This is undoubtedly a short-term measure since Canadian producers have increased prices on domestically produced material and outside suppliers will eventually become competitive again.

Inter-regional trade in softboard (rigid insulation board) has always been almost non-existent and softboard is expected to remain a very minor trade commodity. Trade is more tightly confined within producing regions than for either particleboard or hardboard and world consumption has increased at the very modest rate of less than 0.5% per year over the last decade. Total consumption in both the United States and Canada actually declined between 1969 and 1979 -- from 2.8 to 2.6 billion sq.ft. 3/4" basis.

In summary, of the non-structural panels, particleboard - including MDF - appears to offer the most attractive investment opportunity for Alberta. Technically, aspen and/or poplar has proven to be acceptable in the manufacture of any of the non-structural panel products and the marketing aspect becomes the dominant consideration for any potential developer. MDF appears to be slowly gaining world-wide acceptance, but in common with all of the non-structural wood panels can be manufactured from almost any type of industrial or agricultural waste and this characteristic will always act as an inhibitor to inter-regional trade. Canada will undoubtedly continue to be reliant on the export market for a significant portion of all panelboard sales and the ability to produce non-structural panelboards in the market regions selected, must be carefully weighed.

Price

General price trends (net mill) for the non-structural panels are shown in Table 14. To provide perspective, the Consumer Price Index has also been shown for the same period.

TABLE 14

NON-STRUCTURAL PANELS - PRICE TRENDS

($C/1,000 sq.ft.)

Year	Particle-board	Hard-board	Insulation Board	Consumer Price Index
1976	132	68	111	138
1977	156	75	138	149
1978	253	70	155	161
1979	195	78	187	175
1980	200	84	169	191
1981	202	90	170	211
1982	215	91	172	237
Average Annual Increase:				
	8.5%	5.0%	7.6%	9.4%

Source: Forest Products Distributors, Prices Delivered Toronto.

Note: Prices shown for typical thicknesses and grades sold; i.e., industrial grade 3/4" particleboard, standard 1/8" hardboard and 1/2" sheathing grade insulation board.

Price (cont'd)

Except in the case of particleboard, price increases have lagged significantly behind general price increases. There are many reasons for this decline in profitability, not the least of which is severe competition resulting primarily from excess capacity. Additionally, hardboard imports from countries such as Russia, Poland and South America traditionally have been priced below North American selling prices. A recent anti-dumping ruling in favour of Canadian producers has resulted in hardboard prices remaining stable but competition from thin (1/8" or less) dry process particleboard is also affecting hardboard prices.

Insulation board has experienced severe competition from materials such as styrofoam insulation combined with either plywood or waferboard. To achieve an "R" rating equivalent to 1/2" styrofoam (or similar insulating material) combined with either 3/8" plywood or 7/16" waferboard for wall sheathing would require at least 4 layers of 1/2" rigid insulation board. Since at present styrofoam's market price is less than 1/3 that of insulation board the demand for insulation board is not likely to strengthen. Demand projections are discussed in a following section.

Tariffs

As for plywood and waferboard, Canada has agreed to mutually phased reductions in fibreboard tariffs over the next several years. Present and future tariffs for the major market areas are shown in Table 15.

TABLE 15

PRESENT & AGREED FUTURE TARIFFS - SELECTED REGIONS

Product	1982			1988		
	U.S.	E.E.C.	JAPAN	U.S.	E.E.C.	JAPAN
Particleboard	7.8%	11.5%	17%	4%	10%	12%
Hardboard	5.8%	7.6%	17%	3%	7.6%	12%
Softboard*	Free	7.6%	17%	Free	7.6%	12%

Source: "Multilateral Trade Negotiations - 1979" - Government of Canada.

Note: From 1982 onward, where applicable, tariffs to be reduced in equal annual increments to the final rates shown for 1988.

* Excluding any which contains minerals or are given a decorative finish.

Other than the above tariff charges, there are no restrictions on imports into the major market regions. With some exceptions, panels produced to Canadian Standards comply with world standards. As noted previously, however, for all of these products the value to weight ratio acts as the most effective trade deterrent and tariffs are really a secondary consideration.

Transportation

The effect of transportation costs on structural panels has already been noted. This section refers to the non-structural panelboard products. Even though the low density of softboard provides a relatively high value-to-weight ratio, other transport considerations such as high incidence of damage, excessive reaction to changes in moisture content and generally low tolerance to mechanical handling all act as deterrents to wide-spread distribution.

For all of the non-structural panels, however, the most important factor determining the location of manufacturing units is the fact that all product types can be readily manufactured from almost any type of fibrous waste material. For this reason, the availability of a vast poplar resource in Alberta would be almost irrelevant to a potential plant developer. Proximity to market has always been the determining factor in plant location as evidenced by the wide-spread location of particleboard and fibreboard plants in North America nearly all of which lie within easy trucking distance of the end-use markets.

Future Demand

Estimates of future demand prepared by international agencies are not considered reliable indicators for the purposes of this study. Products included in the various categories are not standard, some for example include waferboard, oriented strand board and MDF in the particleboard category while other agencies do not differentiate between hardboard and softboard.

Future Demand (cont'd)

In C-H's opinion, particleboard demand will result primarily from increased demand for specialty types such as "thin" particleboard and MDF. During the period 1965 to 1970, particleboard consumption in both Canada and the U.S. increased at an average annual rate of approximately 17%. This declined to 12% in Canada and 7.5% in the U.S. over the following five years and declined even further to approximately 7.6% and 3% per year in Canada and the U.S. respectively during the period 1975 to 1980. In C-H's opinion, growth rates will decline sharply over the next decade and will probably not exceed an average of 3% in Canada and 2% in the U.S. to 1990.

Hardboard demand in Canada increased at a fairly consistent rate of approximately 6.5% annually until 1975 at which point demand declined to less than 2% per year. Softboard appears to have peaked and will probably continue at a zero growth rate. A decline may occur if substitute materials gain widespread acceptance. This is, however, impossible to predict. Approximately the same growth trends are expected to occur in the U.S. and estimated demand levels for the three products are shown in Tables 16 and 17 and the implied trends are illustrated in the graphs on the following pages.

TABLE 16
HISTORICAL & PROJECTED DEMAND - NON-STRUCTURAL PANELS
CANADA
(million sq.ft.)

Year	Particleboard (5/8")	Hardboard (1/8")	Softboard (1/2")
1965	90	358	490
1970	183	472	500
1975	330	700	550
1980	477	740	550
1990	640	900	550

TABLE 17
HISTORICAL & PROJECTED DEMAND - NON-STRUCTURAL PANELS
UNITED STATES
(million sq.ft.)

Year	Particleboard (5/8")	Hardboard (1/8")	Softboard (1/2")
1965	900	N/A	N/A
1970	2,000	1,716	5,100
1975	2,500	2,260	5,825
1980	2,950	2,500	5,850
1990	3,590	3,000	5,850

Source: Carroll-Hatch (International) Ltd.

Note: To reduce the effect of short-term violent fluctuations in some cases three year averages have been used.

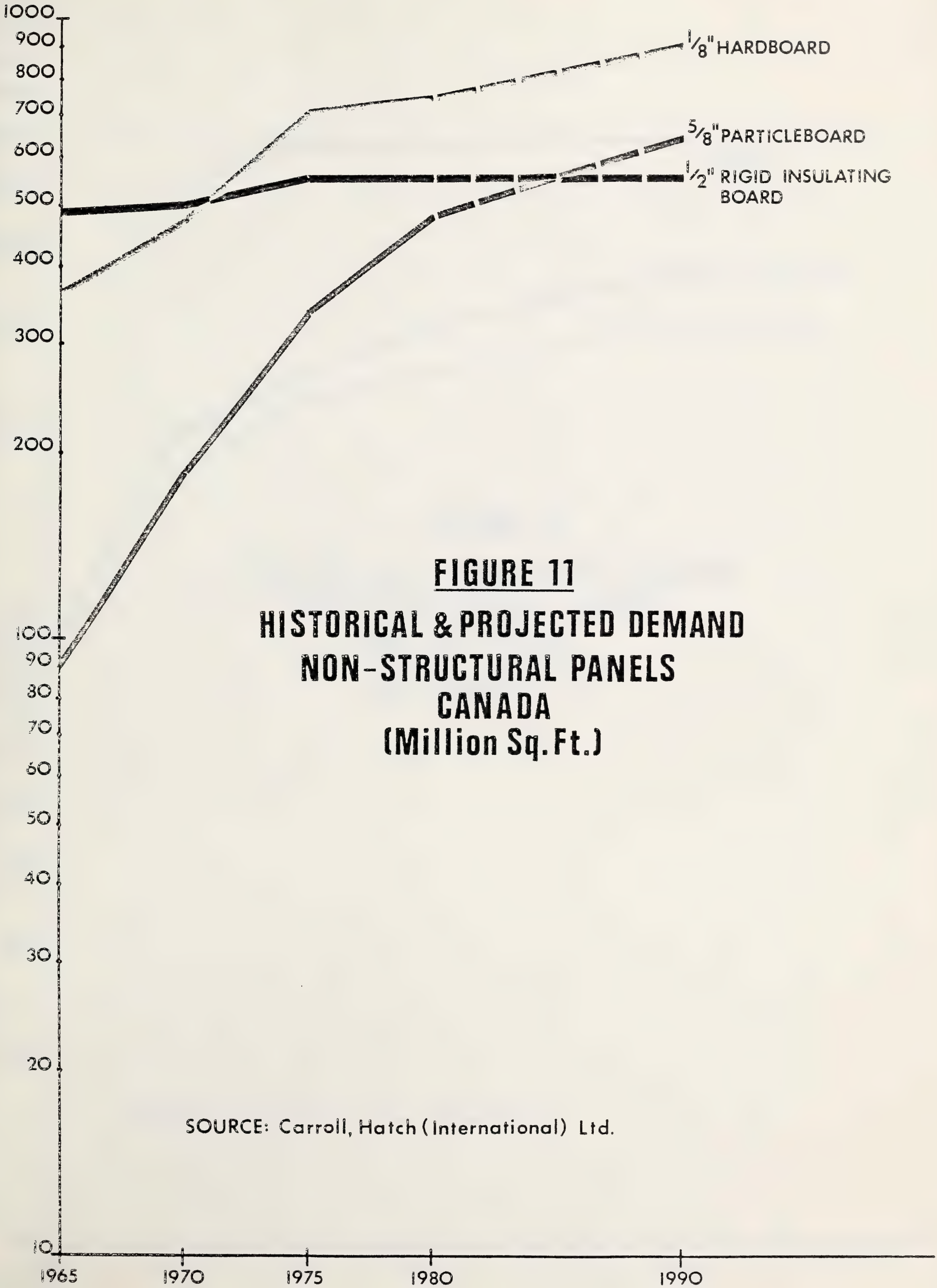


FIGURE 11

HISTORICAL & PROJECTED DEMAND
NON-STRUCTURAL PANELS
CANADA
(Million Sq. Ft.)

SOURCE: Carroll, Hatch (International) Ltd.

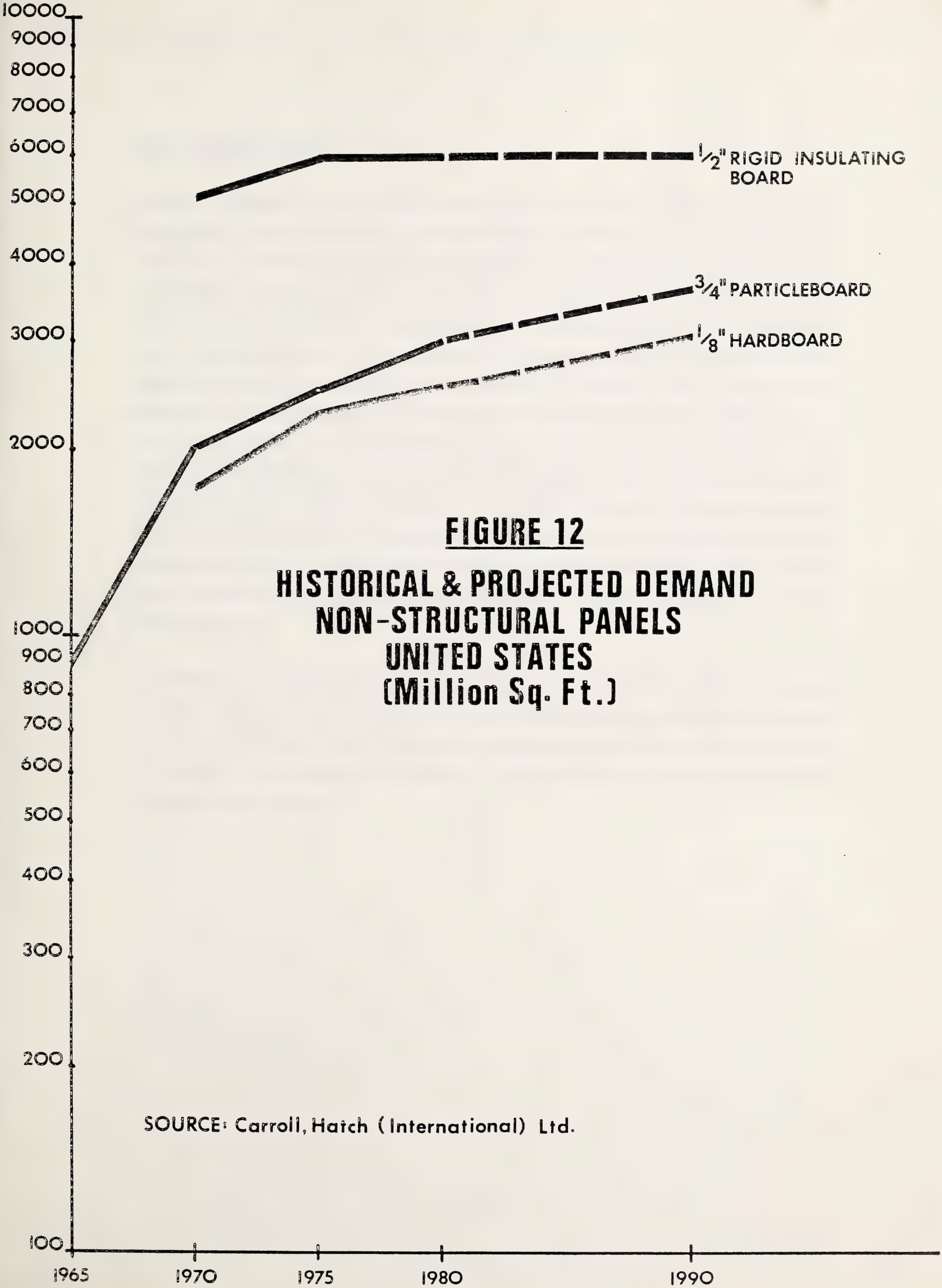


FIGURE 12

**HISTORICAL & PROJECTED DEMAND
NON-STRUCTURAL PANELS
UNITED STATES
(Million Sq. Ft.)**

SOURCE: Carroll, Hatch (International) Ltd.

Future Demand (cont'd)

Whether hardboard and softboard have entered the decay phase of a products life-cycle is problematical but certainly future growth, if any, will occur at a modest rate. Careful selection of particleboard types (probably MDF and high-density dry-process board) should be made since the rate-of-growth of standard industrial particleboard will undoubtedly continue to decline. For Alberta, a major consideration for all products is distance to major markets and this problem is particularly acute for non-structural panels. As with all panel products, expansion of production in Alberta will be almost entirely dependent on the market factor. If a marketing program which ensures an adequate sales volume at an acceptable mill return can be developed then additional productive capacity would be installed in Alberta. Because all non-structural panels can be produced from any fibrous material and because of the escalating impact of transportation costs on distribution patterns the "regionalization" effect more or less eliminates any advantage Alberta may enjoy through posession of a major fibre resource.

A reasonable conclusion is that markets must be found in fibre-deficient regions and this in effect means South-East Asia, including Japan, and selected Western European countries. In other words, there appears little doubt that the economic well-being of any panelboard industry in Alberta will be directly dependent on off-shore export sales.

SPECIALTY PANELS

Production

For convenience, two products have been included in this section -- Laminated Veneer Lumber (LVL) and Veneer. Veneer is normally used to produce plywood or as an overlay on lumber or particleboard core and in this normal use is manufactured either by peeling or slicing, usually in thicknesses ranging from 1/32" to 1/8". LVL, however, is made up of veneers 1/4" or more thick but unlike plywood in which alternate layers of veneer are arranged at right angles to each other, is fabricated up to a thickness of 2 1/2" (or more) with the grain of all veneers running in the same direction. LVL has been conceived and tested satisfactorily as an alternate to lumber rather than as a panel product but is manufactured using plywood techniques and equipment. To date, LVL has been produced only on a semi-commercial basis from poplar but is currently manufactured commercially in the U.S. from low quality oak and in Finland from pine and poplar. Poplar - based LVL has proven to have excellent strength characteristics and displays outstanding stability with radical changes of moisture content. Production of LVL, however, remains virtually non-existent in North America and trend analysis is not possible.

As noted, however, a commercial scale plant recently commenced operations in Finland producing approximately 7 million board feet per year of LVL using both pine and poplar. The product has apparently been well accepted and is used in a variety of applications primarily in structural use in building construction. Development of this product has taken over five years from construction and operation of a pilot plant to commercial production. Cost of development is unknown but 40% of capital and operating costs for both the pilot and commercial plant were reportedly provided by the Finnish Government.

Production (cont'd)

Poplar veneer for plywood manufacture or as a platform panel for overlaying has been produced in North America and overseas on a commercial basis for several decades. Production of poplar plywood in Western Canada has not proven commercially viable and at present all Canadian poplar plywood is manufactured in Ontario and Quebec. The quantities produced are relatively modest and have remained almost stable at approximately 100 million sq.ft. 3/8" since 1960. All attempts to manufacture poplar veneer/plywood in Alberta (Weldwood of Canada, Zeidler Forest Industries, Canfor) have been unsuccessful primarily due to the low recovery of usable veneer from poplar logs. A discussion of the technical reasons for the failure of the poplar veneer/plywood industry in Alberta is beyond the scope of this study but it should be noted that nearly all successful poplar veneer production in Canada is based on the use of a nominal 4'-0" lathe not the standard 8'-0" lathe which has been generally used in Western Canada. A development program based on the use of nominal 4'-0" long poplar peeler blocks may indicate that the recovery factor could be increased to a commercially acceptable level. However, the volume of residuals generated by a plywood operation would have to be disposed of as a source of energy or as furnish for either a reconstituted panel or pulp production.

Consumption

Although a well-established market exists for both hardwood and softwood veneers, poplar veneer accounts for a very minor portion of the market. Availability and not market demand is the main factor inhibiting trade in poplar veneer although, in general, poplar veneer is regarded as more suitable for core material (thus low value) than as a high-value face veneer. Many interviewees expressed the view that a ready market exists for poplar veneer which could be used as a cross-banding under exotic, high cost veneers or as a base for a paint or similar face finish. However, as with production, scarcity of historical data makes trend analysis almost impossible and under existing conditions not very meaningful.

Consumption (cont'd)

All LVL produced in the U.S. is used for furniture construction and is not traded on the open market. The commercial facility in Finland has been in production for too short a period to provide valid estimates of market trends and for all practical purposes LVL may be categorized as an unknown product.

Price

Poplar veneer produced in Western Canada is regarded as a relatively low value product and is used almost entirely as core material. An additional problem to marketing Western produced poplar veneer is the fact that, by convention of COFI members, softwood plywood made under CSA 0121 does not contain poplar veneers as inner plies in structural grade plywood (the mass commodity market) although permitted under the CSA standard. Eastern mills mix poplar and spruce veneers in their plywood. Most poplar veneer cut in Western Canada flows to plywood plants in the North Western region of the U.S. and has been established as an inferior substitute for spruce or fir veneer. Consequently, poplar veneer's selling price has always been lower than either softwood species. At present, the net mill sales return on 1/10" fir veneer is approximately \$19.00/1,000 sq.ft. compared with \$16.00/1,000 sq.ft. for poplar. It is unlikely that poplar veneer production in Alberta, using established techniques, will prove economically feasibile. The recovery factor for softwood veneer and the wide acceptance of softwood veneer tend to balance out any advantage a lower-cost poplar log may possess.

The selling price for LVL has not been established in North America but would certainly be higher than standard lumber. A marketing/promotional program based on the superior performance characteristics of LVL would have to be undertaken in order to capture an acceptable market share.

Tariffs

Duty on poplar veneer into the U.S. (at present the only established export market) amounts to 5% of the FOB mill sales price (U.S. Tariff Item 240.3) dropping to free in 1987. Whether or not exports to either Western Europe or Japan could become economically feasibile is not known, but in any event, no tariff presently exists in either region and is not likely to be applied.

It is probable that LVL would be regarded as a manufactured product and attract tariffs similar to those established for plywood. A final decision, however, would be dependent on negotiations based on the characteristics of commercially produced material. The recent establishment of a commercial plant in Finland would probably result in opposition to imports into the EFTA/EEC areas thus generating tariff restraints.

Transportation

Veneer sales are made on an FOB mill basis with transportation costs the responsibility of the buyer. In general, transport rates are similar to those for plywood but under certain conditions up to 80% of the freight charges on veneer into a re-manufacturing plant - such as a plywood plant - may be deducted from the freight charges applicable to the onward bound plywood or other re-manufactured product. This privilege, which is referred to as "milling-in-transit", is available in any region of Canada or the U.S. providing certain conditions established by the rail carriers are met. Unlike all other panel products, transport costs on veneer have not been a significant inhibitor of trade.

LVL would probably be classified as a board product but may, if considered desirable, obtain classification as lumber. In any event, reliable transport cost data could be obtained subsequent to production of sample panels and negotiation with accredited carriers.

Future Demand

Future usage of open-market poplar veneer will depend on a number of unpredictable factors. These would include the rate of displacement of plywood by panels such as waferboard; the volumes of peeler quality logs available and the future cost relationship between poplar veneer and other overlays such as vinyl and paper print material. In any event, the proportion of high-quality veneer likely to be produced from Alberta's poplar resource will be low and most veneer will be considered suitable only for core-stock.

In summary, future demand for poplar veneer will likely remain stable or gradually decline; no significant increase in demand is anticipated.

Future demand for LVL will depend primarily on availability of supply, cost and the intensity and consistency of the marketing program undertaken. All new structural products require the provision of technical assistance in the form of design data and actual performance results as well as the standard methods of sales promotion, advertising and possibly consignment shipments. The degree to which all of these are undertaken will determine the volume of future consumption of LVL.

PART II - RESEARCH & DEVELOPMENT INDUSTRY

INTRODUCTION

Two studies [1] of the state of the Research & Development industry in Canada have recently been conducted. In both studies the conclusion was reached that, except for the pulp and paper sector, forest products related R&D services in Canada are fragmented and incomplete. This is considered to be particularly true for the wood-based panelboard industry. The panelboard process development center proposed for Alberta was conceived partially to compensate for these deficiencies and partially to act as a focus for panelboard development activities in Canada.

In order to assess the validity of this rationale, an analysis of the present R&D industry has been carried out and the results are presented in this section.

An overview of the R&D industry as it relates to the forestry sector is presented first and this is followed by a discussion of the relationship of the services which might be provided by a development center to the forest products industry as perceived by a majority of the interviewees.

Finally, a summary of the responses received in answer to the key questions regarding the value, financing, probable usage and significance to the poplar-based forest industry in Alberta is presented.

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1. Information Report "R&D in Solid Wood Products" - Environment Canada, Forestry Service - Dr. V.N.P. Mathur.

FOREST RELATED R&D - OVERVIEW

Virtually all R&D activities in Canada are conducted by provincial or federal government agencies, universities and forestry schools, trade associations, suppliers (equipment and materials) and the major-sized forest products companies. Each of these sectors will be discussed separately in this section of the report but in order to provide a reasonable perspective from which to assess the degree of adequacy of forest-related R&D a brief review of the significance of the forest products industry to Canada and to Alberta is considered desirable.

The contribution made to Canada's GNP in 1979 by each of the major components of the forest industry is shown in Table 18.

TABLE 18

CANADA - FOREST INDUSTRY

VALUE OF SHIPMENTS & EMPLOYMENT - 1979

Sector	Value of Shipments - Own Manufacture (million $C)	Value Added (million $C)	Total Employment (number)
Logging	5,021	2,035	56,614
Wood Industries			
Sawmills & Planing	5,676	2,610	68,328
Veneer & Plywood	888	380	13,618
Other (Shingle, Particleboard, etc.)	2,244	975	40,102
Sub-Total	8,808	3,965	122,048
Paper & Allied Industries			
Pulp & Paper Mills	9,282	4,539	87,055
Other (Roofing, Box, Paper Converters, etc.)	3,005	1,194	41,863
Sub-Total	12,287	5,733	128,918
Total	26,116	11,733	307,580

Source: Canadian Forestry Statistics - 1979.

In 1979, the forest industry accounted for 17% of total Canadian GNP. The relative value of the industry to each Province is indicated by the data in Table 19.

TABLE 19

VALUE ADDED IN MANUFACTURING IN FOREST INDUSTRY BY PROVINCE - 1979

($ Million)

Province	Value Added in Forest Industry	Value Added in Total Mfg.	Share of Total Mfg. (Percent)
Newfoundland	168.8	488.8	34.5
Prince Edward Island	2.0	75.5	2.5
Nova Scotia	210.2	1,030.7	20.4
New Brunswick	343.5	905.7	37.9
Quebec	2,712.6	16,365.1	16.6
Ontario	2,263.8	30,327.5	7.5
Manitoba	106.8	1,529.2	7.0
Saskatchewan	53.5	670.5	8.0
Alberta	324.5	2,888.4	11.2
British Columbia	3,389.1	6,331.3	53.5
Yukon & N.W. Territories	n/a	n/a	-
Total Canada	9,698.2	60,623.2	16.0 (approx.)

Source: Statistics Canada Catalogue 31-203. "Manufacturing Industries of Canada: National and Provincial Areas".

Note: In some provinces certain classes of manufacture data are not published for reasons of confidentiality. For example, Saskatchewan does not provide pulp production data. Value added data shown is for value added only in the manufacturing industry and does not include value added in the logging industry.

FORFST-RELATED R&D - OVERVIEW (cont'd)

Expenditures on R&D services to support the total Canadian forest-based industry amounted to approximately $142 million [1] in 1979. This includes every aspect of the forest industry from planting through to ultimate end-use. It also includes estimates of overheads and other indeterminate costs in universities and similar institutions. Approximately 38% ($53.5 million) was contributed through various federal agencies, 18% ($25 million) through provincial agencies and 16% by major-sized manufacturers.

Of the total R&D expenditure an estimated 13.6% ($19.2 million) was directed to wood products R&D, with 60% ($85 million) expended in the fields of forestry and environment. Dr. Mathur's analysis of wood products research funding in 1977 indicated the source of funds as shown in Table 20.

TABLE 20

WOOD PRODUCTS RESEARCH EXPENDITURE
CANADA - 1977
($1,000)

Sector	1977
Major Companies	3,750
Smaller Companies	1,250
Universities	840
Associations	325
Provincial Laboratories (Research Councils?)	1,620
Suppliers	3,775
Federal	6,300
	$17,860

1. "Forest Research in Canada" - Forestry Advisory Council.

FOREST-RELATED R&D - OVERVIEW (cont'd)

Unlike most capital expenditures R&D budgets are apparently not a function of the rate of inflation, but seem to be influenced much more strongly by general economic conditions and trends. Consequently, expenditures for 1981/82 are probably less (in 1977 dollars) than those for 1977 since none of the respondents believed any increase has occurred since 1977.

In any event, the estimates shown in Table 3 are considered reasonably accurate and are probably valid reflections of the importance (or non-importance) attached to wood products R&D services by industry and by government as a whole.

Total Canadian forest-related R&D expenditures in 1979 amounted to less than 0.4% of the value of total shipments. In general, the expenditure for all Canadian manufacturing averages 0.8 to 1% which indicates that forest-related R&D expenditures are approximately 1/2 of those for all Canadian manufacturing. When it is further realized that the major portion of forest-related R&D funds are directed to forestry and environmental considerations the inadequacy of forest-products related R&D activities becomes evident.

The specific relationship of Alberta's proposed product development center to the overall R&D industry will be evaluated in the discussions of each of the major sectors concerned with R&D services - forest product companies, trade associations, universities provincial and federal agencies and suppliers of equipment and materials - presented in the following paragraphs.

FOREST PRODUCTS INDUSTRY R&D

General

At least 95% of all R&D activity in the forest products industry is carried on by a relatively few companies and these are all major-sized. Organizations such as MacMillan Bloedel, Canadian Forest Products, Northwood, Domtar and Abitibi account for most of the development work in Canada and two of these are deeply involved with research directed to their affiliates and subsidiaries in the U.S.A. Other organizations such as Weldwood, British Columbia Forest Products and Crown Zellerbach engage in development activities from time-to-time but do not possess separate R&D departments or budgets. The smaller companies also engage in development work but on a sporadic and very short-term basis directed mainly to solving immediate problems..

Two medium sized Canadian panel mills are affiliated with European panel and machinery producers and rely very heavily on these for new product, process and equipment research, almost to the exclusion of any Canadian involvement.

This structure of the R&D industry in Canada is in the United States but the major U.S. companies are much more heavily involved in R&D than their counter-parts in Canada. Organizations such as Weyerhaeuser, Champion International, Potlatch Corporation, Simpson Timber, Louisiana-Pacific and others maintain full-time research facilities and staff as well as co-operating with government laboratories. Reliable estimates of expenditures on R&D are not available from these companies but it is readily apparent that wood products R&D is regarded as a very important part of corporate development and appears to receive a much higher priority than is generally the case in Canada.

General (cont'd)

As a case in point, International Paper Company is in the process of finalizing plans for the construction of a pilot plant in the south eastern U.S.A. for the manufacture of a range of reconstituted wood panels including waferboard, OSB and particleboard. Although this is referred to as a test plant or development center, the plant will, in fact, possess commercial production capability. Press size will be 7' x 16' providing a capacity of 100 tons per day output. Total capital investment is expected to exceed $U.S. 15 million and revenue will be received from marketing the plant's output as well as from leasing the plant and staff, if required, to public or private organizations for research and development programs. After extensive evaluation of existing private and public R&D facilities, International Paper concluded that the errors and discrepancies in scaling up from an 8' long 4' wide press were as great as those to be expected in scaling up from the normal 2' x 2' laboratory size panels.

This point was mentioned in several interviews in Canada and the U.S.A. Since most mills of the particleboard/waferboard type have or will have presses in the 8' x 24' sizes, there will be many unknown process variables such as density control, moisture dispersion etc., which will not be solved until full-sized press size operation is underway. Therefore, in the opinion of International Paper R&D personnel, no significant advantage would result from experimenting with a 4' x 8' press unless the ultimate commercial development also utilized a 4' x 8' press. This is very rarely the case. Most press sizes are now in the range 4' x 16' to 8' x 50'.

Scope

Traditionally within the wood products segment, most R&D expenditures have been made in programs related to the manufacture or treating of lumber or softwood plywood. Only recently has attention in North America turned to the reconstituted panel sector. Most developments in this segment of the industry have resulted from research projects initiated in Western Europe, particularly

Scope (cont'd)

Germany and Italy. The notable exception to this rule has been waferboard which has been almost exclusively a North American development with Canada playing the leadership role. Waferboard provides a classic example of the methods which have become traditional in the forest products industry for the introduction of new products.

Waferboard production was initiated in a small plant in Idaho, in the late 1950's. The plant employed more or less standard particleboard equipment modified to suit the shape and thickness of wafers rather than chips. Production of the wafers represented the only technological advance and the waferizing process was developed and patented by an equipment supplier working in conjunction with a forest products manufacturer. This initial plant failed and the next waferboard plant was constructed in 1962 in Saskatchewan. After several years of erratic performance, the process was sufficiently refined and the markets sufficiently well established to permit large scale economic production. As noted previously, installed capacity has expanded dramatically over the past two years or so but it is important to recognize the long (over 20 years) history of development required. In effect, the process was one of evolution directed by a company with marketing, production and a research capability, coupled with financial resources to maintain the impetus to develop the new product. This has been the case for virtually all new forest products.

Reaction to Panelboard Development Facility

Most forest products companies concentrate on short term (up to one year) development projects and consider long-term development to be the responsibility of equipment and material suppliers and government agencies. The concensus is that very little remains to be accomplished in the area of basic research. The technical properties and performance characteristics of all Canadian species are considered to be sufficiently well identified and documented to render further basic research non-productive. In industry's view,

Reaction to Panelboard Development Facility (cont'd)

what is now required is more efficient converting and marketing techniques. From this point-of-view, a panelboard development facility is a logical development but the degree of financial support which would be offered appears to be very low. The lack of support is clearly evident from the answers obtained from forest product producers during the field interviews. The key questions with proportionate responses are shown below:

	Question	Response - Percent [1]		
		Yes	No	Undecided
1.	Do you believe that a panel product development facility located in Alberta would be desirable?	32	48	20
2.	Do you believe that a panelboard development facility would receive widespread support from your industry?	9	81	10
3.	Would your company be willing to provide financial support on a regular basis?	0	97	3
4.	Do you believe that a panelboard development facility would be an effective inducement for industry to either expand present operations or to construct new conversion units in Alberta based on the poplar resource?	0	100	0

1. Results rounded to nearest unit.

Reaction to Panelboard Development Facility (cont'd)

It is clearly evident that in the unanimous opinion of the forest industry interviewees there is no relationship between the proposed panelboard development facility and the inducement of industry to Alberta. The two are considered to be entirely unrelated issues. Additionally, although the above responses indicate fairly strong moral and political support for a panelboard research facility, this support does not extend to the financial level. In other words, the industry's view is that while a development facility would be a very useful facility to have readily available, none believe strongly enough in the concept to become financially committed.

On the question of the proposed facility acting as an incentive to industry to expand Alberta's manufacturing capability utilizing the poplar resource, opinion was unanimous that the research facility would be completely ineffective in that context.

The unanimity of the response to the foregoing key questions indicates very clearly and definitively that the proposed panelboard development facility would have no influence one way or the other on additional utilization of Alberta's poplar. The question as to whether or not the facility would be beneficial to Alberta in its own right as an independent research facility was also discussed and the majority of interviewees (92%) agreed that the facility would not prove of benefit to Alberta.

In summary, the forest products industry would welcome a panelboard development facility in Alberta - or anywhere else - but would not provide financial support nor commit itself to regular usage of the facility. Development of Alberta's poplar resource would not be influenced in any manner by the facility and the only benefit to Alberta would be through job-creation to operate the facility and from any possible operating profit.

Comments

This sub-section presents a summary of comments made by forest industry personnel during the course of the field interviews. Suggestions regarding methods for inducing industry into Alberta were made but are not included here. The more significant suggestions are discussed in Part IV of this report. Comments reproduced here reflect the opinions of a number of interviewees and therefore represent generally held industry views rather than the opinion of one or two persons.

1. Any research center should possess the capability of conducting research into the whole range of forest products not just panelboards.

2. Most development work is considered to be highly confidential, at least in the initial stages, and the aspect of security would be a major concern regarding a publicly operated facility.

3. Capability of producing a 4' x 8' test panel would be desirable but is not considered necessary and, in any event, would still leave some problems unresolved.

4. Reconstituted wood panels will gradually displace plywood, and waferboard production/demand will grow at a much faster rate than any of the other reconstituted wood panels.

5. OSB has a strong growth potential but at present is considered an almost unknown product and faces a long period of market development involving code acceptance as well as acceptance by the building industry.

6. Demand for MDF will continue to grow at a modest rate in North America, but not at a rate equal to that for waferboard.

Comments (cont'd)

7. Decisions to construct plants are normally based on assessment of economic factors such as wood cost, labour cost (and stability), market location and availability of services and supplies, not on proximity or capability of research facilities.

8. The basic technology for all of the known (or likely) board production processes has already been developed and modifications will develop naturally as a result of economic pressure on commercial production costs.

9. No new structural grade plywood plants will ever again be built in North America and all such plants will become obsolete within 10 to 20 years.

10. Funds might be more usefully employed in support of Forintek.

11. Research into new structural panels, eg., honey-comb, plywood/particleboard core, floor systems, end/edge gluing into large panels, etc. would require an engineering type laboratory rather than a 4' x 8' press facility.

Opinions regarding future trends in the panel products industry confirm trends developed from the statistical data in the preceding section. There appears to be no doubt that waferboard is regarded as the most promising panel product on the market today and that waferboard's principal competitor, structural grade plywood, will decline in importance in direct proportion to waferboard's growth. From Alberta's view point these are important trends because all waferboard process/product developments have been based on the use of poplar and Alberta's poplar has proven only minimally acceptable for plywood production.

The comments regarding the panelboard development facility are self-explanatory.

EQUIPMENT & MATERIAL SUPPLIERS

General

Within sharply defined limits, equipment producers and chemical companies have played a leading role in developing and refining panelboard manufacturing techniques. The limits are established by the suppliers' own economic interests, and the fact that no single supplier is able to offer a complete range of equipment, material or services. Within these limits, however, suppliers participate to a greater or lesser degree in every technological development and are a vital element in process/product research and development.

Scope

German-based equipment suppliers undoubtedly provide the most comprehensive range of R&D services to industry and government agencies. They also conduct extensive R&D projects on an in-house basis. Most particleboard manufacturing techniques have been developed by the German equipment industry with organizations such as Siempelkamp, Schenck, Dieffenbacher, Bison-Werke, and Pallmann maintaining commercial sized R&D units on a continuing basis. All of these facilities are readily available and usually at no-cost to potential clients.

Several North American based equipment suppliers also offer R&D similar to the European based companies. Most North American suppliers, however, restrict development programs to modification of existing equipment or processess and, in addition, the programs are usually restricted to one or two pieces of equipment and to a small section of the overall production process. As a result of these factors, any development/testing work initiated in North America becomes very time consuming and can be carried out only on a fragmented basis.

Scope (cont'd)

As an example, to determine the suitability of poplar from the High Prairie region as a furnish for a particular type of particleboard, the following procedure was necessary. (It should be noted that many of the steps would also have been necessary if the material had been sent to W. Germany).

1. Trees felled and the required volumes of both Aspen and Black Poplar assembled in High Prairie.

2. Logs crated, tagged and clearly identified for controlled fibre preparation as well as for U.S. customs purposes.

3. Logs trucked to New Jersey, U.S.A., where Pallmann (a branch of a major German equipment supplier) has established a wide range of fibre preparation facilities such as chippers, flakers, hammer-mills, refiners and essential screening equipment.

4. Logs converted to chips and then refined to acceptable sizes by Pallmann and the quality and size distribution of the resultant furnish screened and analysed for quality and size distribution.

5. Furnish packed in separate containers clearly labeled and documented for shipment to Borden Chemicals, Vancouver. Export/import documents prepared and cleared as well as transport arranged.

6. Using existing laboratory facilities, Borden Chemicals dried, blended, formed, pressed and trimmed several dozen 2' x 2' samples of particleboard containing various proportions of adhesive, moisture, particle sizes and species.

7. Borden then conducted performance tests on these samples in their own laboratory and developed data to allow comparison with the performance, adhesive requirements, press time and similar characteristics of other competing panel types.

Scope (cont'd)

In all, the above procedure required 6 months from felling of trees to completion of test results on the resultant panels. There are other methods which could have been adopted but, within limits, all presently available procedures require much the same time, must be conducted on the same fragmented basis and present identical transport and import/export problems.

The advantages of the present system are economy and the use of the most technologically advanced pieces of equipment and adhesives. The principal disadvantages are the length of time required, the lack of control during transport and the preparation of the raw furnish and testing of the experimental panels. Except in rare instances, all of the development work is carried out by supplier's staff at supplier's convenience and is normally unsupervised by the client (although clients with research or quality control staff maintain a reasonably close liaison).

The alternative is to utilize operating plants and, frequently, this method is used by the major forest products companies. The major disadvantages of this method are the unavoidable disruption to normal production and the necessity of preparing the system for the experimental material and then again preparing the system for the normal production process after the experimental run. A second major disadvantage is that in some cases the equipment which must be used is bordering on obsolescence and the results of the test run would not necessarily be duplicated with new equipment. A third disadvantage is cost. A major forest products company recently completed trial production of waferboard in a commercial waferboard plant to test a recently developed binder and the cost was estimated to amount to approximately $3,000.00 per hour in direct costs - administration and other overhead costs not included.

Scope (cont'd)

Several medium-sized panel producers will lease out production units to outside researchers and, in fact, this arrangement is not unusual, particularly in Ontario and Quebec. Three such test programs, recently completed, required 36 hours of the plant's operating time for each test and cost approximately $70,000.00. The companies conducting the development program selected this method because of the greater degree of direct control which they could exercise and because the results were based on commercial equipment and procedures. Two mills [1] which were available for this research are modern and well equipped.

Reaction to Panelboard Development Facility

Except for those manufacturers who hoped to supply equipment to the proposed process development project in Alberta, none believed the facility would prove beneficial to Alberta. Further, none of the suppliers believed that the existence of the plant in Alberta would be considered an incentive for equipment producers to establish equipment manufacturing facilities in Alberta. In the opinion of the vast majority of interviewees, the facility would become obsolete very quickly since the rate of change in the design and application of equipment has accelerated dramatically in the last decade or so and will probably continue to accelerate. To keep pace with industry developments, equipment in the proposed plant would have to be constantly modified or replaced.

All suppliers, however, agree that the proposed facility would offer a service which is not presently available and which would perform a useful function for industry but which would never become economically viable. The frequency of use of the plant would, in all probability, be low.

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1. Waferboard Corporation - Ontario.
   MacMillan & Bloedel - Ontario.

Comments

1. Major discrepancies occur in interpreting results, based on a pilot plant, when applied to a full sized plant.

2. Consistent annual subsidies from 80 to 100% of total costs would be required.

3. Technical aspects of processing poplar are well researched and implementation on a commercial scale is the only requirement.

4. Development of a panelboard plant is purely economic and not based on R&D facilities.

UNIVERSITIES

General

Of the more than 44 accredited Universities in Canada, research in wood products appears to have been carried out in no more than twelve and in most of this latter group the work has been on a sporadic basis. Total funding of forest products R&D activity in Universities was estimated to amount to $840,000 in 1977 and has reportedly decreased since that time. There are six professional forestry schools in Canada and most of the forest-related studies are conducted in these six institutions, either in the forestry or engineering faculties.

In addition to receiving a proportion of the internal funds allocated to forest-related research, the six institutes received external funding (grants and contracts) in the amounts shown in Table 21.

TABLE 21

FOREST RELATED RESEARCH FUNDING FROM EXTERNAL SOURCES - LEADING FOREST RESEARCH SCHOOLS

($1,000)

School	1978 - 79
University of Alberta	358
University of B.C.	545
Lakehead University	196
Laval University	484
University of New Brunswick	391
University of Toronto	202
	2,176

Source: Canadian Forestry Advisory Council.

General (cont'd)

It should be noted that most of the funds provided from either internal or external sources is applied to research in fields other than wood products. The proportion varies from year to year but for the year shown wood products research reportedly accounted for approximately 30% of the total.

Scope

Generally, wood products research programs at Universities are related to the individual interests of professors or other research-oriented staff or are conducted to achieve specific results established by clients usually representing forest industry companies. As examples of some of these research projects the following were reported by Dr. Mathur in his report of 1977.

1. Lakehead University - Waferboard processing research.

2. University of Laval - Wood seasoning, impregnation anatomical structure, waferboard processing and end-use applications.

3. University of New Brunswick - Diffusion of gases in wood and inter-action of coatings on surfaces and wood structures.

4. University of Alberta - Wood in structures research - laminated wood beams.

5. University of B.C. - In grade testing of lumber, testing of structures and the fundamental strength properties of all species.

Scope (cont'd)

In addition, the University of Toronto is conducting limited research into the preparation of wafers (concerned with the quality of wafers) and has the capability of producing and testing 24" x 24" panels. Experimental "sandwich and honey comb" panels have also been produced. The university plans to expand this type of R&D capability and continue to undertake relatively short term contracts which can be scheduled with the teaching requirements of the university year.

Interviews with university personnel during the course of this study revealed that research funding, philosophy and activity at universities have not changed significantly since 1977 and probably will not change in the future. In effect, university research is oriented towards fundamental research in wood science and properties and not generally towards process/product development techniques. This is probably as it should be, since, except in the case of research programs conducted by chemical companies and Forintek, basic research is not conducted on a consistent basis by any other interested group.

Although university research provides valuable and essential information to industry, no university is in a position to provide results-oriented product/process development assistance to the forest products industry. This restriction, combined with a universal policy of publicizing the results of university research (except for some contract programs), tends to lessen the value of university facilities to industry.

Reaction to Panelboard Development Facility

In the unanimous opinion of the university staff interviewed, the proposed pilot plant would make a valuable contribution to Canada's overall R&D effort. All were of the opinion that research funding in Canada is pitifully low and expansion into any area could only be beneficial.

Reaction to Panelboard Development Facility (cont'd)

On the question as to whether or not universities would use the plant on a consistent basis, however, opinion was sharply divided with "undecided" in the majority.

The majority again had no opinion on the value of the plant as an inducement to industry to utilize Alberta's poplar but a minority believed that the plant would prove useful in this regard.

Comments

Most comments and/or suggestions made by university staff were of a very generalized nature regarding the role of research in Canada and had only minor relevance to this study. Some, however, were pertinent and are summarized here.

1. A panelboard development facility should be tied-in with government housing programs and the material produced in the plant used by all government departments such as subsidized housing schemes and public works activities.

2. The plant would probably be more beneficial and economic if production were to be increased to a semi-commercial level

3. The plant should be under the control of the Alberta Research Council - primarily to ensure confidentiality but also to ensure adherence to technically correct procedures.

4. Private industry, however, should manage the plant on a day to day basis to ensure adherence to industry standards and requirements.

Comments (cont'd)

Although university based research has made and will probably continue to make valuable contributions to the development of the forest products industry, except for research guided by industry, actual economic benefits resulting from this research are not generally recognized as being significant. Part of the problem undoubtedly can be attributed to lack of communication or co-ordination with industry and industry's needs. The quality and range of equipment and the highly trained and dedicated staff available at Canadian Universities constitutes an enormous potential for forest products research and development programs. This is not to suggest that present university facilities would be able to perform a service equivalent to that of the proposed product development facility, but in combination with other available R&D facilities, university-based resources offer an extremely comprehensive range of R&D services. The critical missing element appears to be the universal ailment of inadequate two-way communication and lack of a central co-ordinating entity.

REMANUFACTURERS

General

Included in this group of interviewees are factory manufacturers of residential and commercial units; home builders; cabinet producers; furniture manufacturers; truck body fabricators; wood-based component fabricators, and other miscellaneous industrial consumers. Collectively these industrial consumers purchased $202 million worth of panels and veneer in 1979 of which 75%, $151 million were products referred to in this report. (See Appendix 6, Table 35).

Most have had some experience with poplar products and, except for poplar lumber which has found general acceptance only as a pallet or crate making material, tend to regard poplar panels as being similar to fir or spruce panels. If a panel performs adequately, is available on a consistent basis and is priced reasonably the species does not appear to exert a significant influence one way or the other. Pre-finishers and laminators appeared equally divided over the surface qualities of particleboard. Some considered poplar species produce a "fuzzy" surface except when made from flaked material. Others claimed particleboard made from spruce or coniferous mill waste gave the same poor surface. Both groups have adjusted to the type of panel which they purchase on the basis of price and neither suggested this would require a specific R&D centre to overcome the problem.

Two of the world's leading producers of factory-manufactured housing units are located in Alberta - ATCO and Engineered Homes -and both utilize considerable volumes of wood-based products annually. In an average year the two organizations combined use an estimated $6.5 million worth of wood-based products, primarily panelboards of one type or another, representing about 25% of the annual consumption in Canada by the factory built home industry.

Scope

All of the interviewees were familiar with all of the panels available, and believed that industry is effectively communicating new product developments and end-use applications to the remanufacturer.

Areas suggested for additional development work included fire retardancy, face-finishes and more efficient methods for combining wood-based products with other materials, e.g. end-gluing in wall panels, nailing, etc. Those interviewees concerned with the housing industry were unanimous in the opinion that the most benefit to the forest industry would result from consistent, co-ordinated work with specifying bodies such as housing authorities, public works departments, architects and engineers, and other organizations responsible for the acceptance of products for various uses. The point was made by several interviewees that some government specifications still restrict acceptable panels to Douglas Fir plywood only despite the lower cost and equivalent performance capability of other panel types, in particular waferboard.

Reaction to Panelboard Development Facility

Other than a generalized feeling that a process development facility would be a useful facility, the majority of the interviewees in this category had no strong opinions regarding the panelboard development facility. Most, however, could see no relationship between the proposed plant and inducing industry into Alberta. Very few (less than 5%) believed that their own organization would ever use the plant and none believed any financial support would be provided.

The majority of interviewees with firm opinions believed that the forest products industry already provides all of the development and testing services required, and that the acceptance of responsibility for the performance of new or modified products by private industry was a key element in the relationship between supplier and end-user.

Comments

The segment of the wood industry included in this sub-section had few relevant suggestions or comments regarding the panelboard development facility but a number of comments were made regarding the overall industry which do have relevance to this study and are reproduced here:

1. A major program should be undertaken to familiarize the ultimate end-user with the characteristics and capabilities of waferboard.

2. Poplar-based laminated-veneer-lumber would be of major interest to manufacturers of homes, trailers, and other products in which strength, consistency and light weight are prime considerations.

3. All particleboard has to be imported from outside Alberta (primarily the U.S.) and a high quality industrial particleboard produced in Alberta would be well received.

4. Waferboard/particleboard/hardboard will gradually displace plywood in nearly all structural and non-structural end-uses with waferboard enjoying the highest growth rate.

It is apparent that the remanufacturing segment of the wood-products industry is not aware of any deficiencies in existing R&D services, and has no firm opinions regarding the value or non-value of a panelboard development facility. Additionally, except for relatively insignificant modifications, suggestions regarding new products or modifications to existing products were noticeable by their absence. In effect, the industry appears to believe that the pace of product development has been satisfactory and a radical change in existing methods is unnecessary. Further, surprisingly enough, no new products or product adaptations were suggested for development. The conclusion to be drawn is that the end-using industry relies almost completely on the primary producer for all product development and innovation.

PART III - TRANSPORTATION CONSIDERATIONS

INTRODUCTION

Traditionally, the cost of transporting forest products to market has always exerted a significant influence on an operation's profitability. Most production units are located close to the raw material supply which is normally - at least in Canada - located long distances from the market place. This is particularly true for plants in Western Canada which are located long distances from the principal markets of Eastern Canada and the United States. Recent sharp increases in transport costs relative to increases in the selling prices of panelboards have exacerbated this marketing problem and the possibility of Alberta providing some type of transport subsidy to private industry has been suggested for investigation. Accordingly, this section of the report presents an analysis of transport costs as related to panelboards, reviews current panelboard transport relationships in North America, and finally, discusses Alberta's position relative to these considerations. Responses from interviewees regarding the possibility of the Government of Alberta providing some form of transport cost relief are also outlined.

TRANSPORTATION COST BASICS

The cost of moving commodity products is usually related directly to weight and bulk. For virtually all forest products the governing factor is weight. For this reason the basic density of a product is an important characteristic and the densities of the panelboards under review is shown in Table 22.

TABLE 22

AVERAGE DENSITIES - PANEL PRODUCTS

Product	Density (lbs./cu.ft.)	Weight* (lbs./M sq.ft.)
Rigid Insulation Board	20	937 (9/16")
Softwood Plywood	32	1,000 (3/8")
Particleboard	40	2,500 (3/4")
Waferboard	42	1,312 (3/8")
MDF	50	3,125 (3/4")
Hardboard	62	645 (1/8")

Source: Carroll-Hatch (International) Ltd.

* Expressed in terms of principal units of sale.

TRANSPORTATION COST BASICS (cont'd)

As will be shown later, within fairly narrow limits, all of the above products attract equal transport rates both nationally and internationally. A logical conclusion therefore would be that the existing (and historical) transport rate system would have a much greater impact on hardboard than on softwood plywood. This, in fact, has proven to be the case. Hardboard sales are restricted to regions close to producing plants while softwood plywood markets have been established on a broad basis domestically and internationally. In the opinion of many of the interviewees, "regionalization" of sales will, in fact, gradually develop for all panel products and inter-regional sales will be possible only to areas which are or will become seriously deficient in fibre supply. Most believed these areas would be outside North America and included Japan, Taiwan, South Korea, and certain Western European countries. In other words, industry believes that establishing overseas export markets will become essential for Western-based producers.

PRODUCT RELATIONSHIPS

After basic density, the second most important factor which heavily influences economic shipping distance is, of course, selling price or the value of the product being transported. This factor is usually combined with density to provide a rule-of-thumb guide referred to as the "value-to-weight" ratio. The higher this value, the further may the product be shipped economically. Traditionally, the value-to-weight ratio for wood-based panel products has been low compared with most commodities and, as shown in Table 23, the ratio has been adversely affected by recent sharp increases in transport costs which have out-paced increases in panel selling prices.

TABLE 23

AVERAGE ANNUAL INCREASE PANEL PRODUCTS - NET MILL SALES PRICES AND RAIL RATES

Product	Unit	Net Mill Return 1976	Net Mill Return 1981	Average Annual Rate of Increase
	(1,000 sq.ft.)	($)	($)	(%)
Softwood Plywood	3/8"	120	190	9.6
Waferboard	3/8"	105	140	6.0
Particleboard	3/4"	115	180	9.4
Hardboard	1/8"	55	85	9.1
Insulation Board	9/16"	90	120	5.9
MDF	3/4"	195	290	8.3
Rail Rates:				
Vancouver-Toronto	$/100 lbs.	1.85	4.35	19%

Source: Road and Rail Transport Organizations.
Panel Product Manufacturers.

PRODUCT RELATIONSHIPS (cont'd)

All of the average annual increases in mill return prices for panelboards are well below the 19% increase in rail rates. For waferboard and insulation board the increases are also well below the inflation rate over the same period. This will be discussed more thoroughly in a later section.

The direct effects of transport costs and the value-to-weight ratios are demonstrated in Table 24.

TABLE 24

TRANSPORT COSTS AS A PROPORTION OF DELIVERED COSTS
PANEL PRODUCTS - VANCOUVER TO TORONTO -
FEBRUARY 1982

(Rate $4.35/100 lbs.)

Product	Unit (1000 sq.ft.)	Weight Per Unit (lbs.)	Net Mill Price ($/1000)	Freight ($)	Delivered Price ($)	Freight Proportion (%)
Softwood Plywood	3/8"	1,000	190	$ 43.50	$233.50	19
Waferboard	3/8"	1,312	140	57.10	197.10	29
Particleboard	3/4"	2,500	190	108.75	298.75	36
Hardboard	1/8"	645	85	28.05	113.50	25
Insulation Board	9/16"	937	140	40.76	180.76	23
MDF	3/4"	3,125	295	135.94	430.94	32

Note: Factors such as sales tax and discounts have been ignored for clarity.

PRODUCT RELATIONSHIP (cont'd)

The benefit of plywood's lower weight is clearly apparent and is considered to be one of the reasons for the modest displacement achieved by waferboard to date despite a significantly lower net mill selling price. In actual practice, however, waferboard is supplied to Toronto and other major Canadian markets from waferboard plants located much closer to the market than most of the softwood plywood plants. The actual relative positions of major markets and major supply sources is discussed in the following sections.

COMPETITIVE TRANSPORTATION RELATIONSHIPS

Technically, Alberta's poplar resource is more suitable for the manufacture of reconstituted wood panels than it is for the manufacture of plywood. Of the accepted reconstituted wood panels - particleboard, waferboard, hardboard, rigid insulation board - the potential market for waferboard appears to be much greater than for the other types primarily because waferboard has gained acceptance as a substitute for sheathing grade exterior plywood. Therefore, the location of the principal suppliers of exterior grade plywood relative to major markets is of great interest to this study as is the relative location of waferboard producers to the same markets. The rail rates [1] from major softwood plywood and waferboard supply centers to the principal market regions are shown in Tables 25 and 26. These two products compete directly for the same end-use markets and should therefore be considered as a single product from a marketing transport viewpoint. Table 25 shows rates to Canadian and Table 26 to U.S markets.

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1. A comprehensive listing of current road and rail rates for all panelboard products to all principal markets is contained in Appendix 5.

TABLE 25

STRUCTURAL PANEL RAIL RATES FROM MAJOR SHIPPING POINTS TO PRINCIPAL MARKETS - CANADA

($C/100 lbs.)

FROM	TO					
	Vancouver	Edmonton	Regina	Winnipeg	Toronto	Montreal
Vancouver	-	1.75	2.57	3.18	4.06	4.06
Mitsue	1.82	0.56	1.55	1.95	3.96	3.96
Longlac	4.82	3.43	3.07	1.64	1.18	1.40
Chatham	5.80	5.10	4.75	3.92	1.24	1.03
Portland	N	N	N	N	6.24	5.89
Hayward	N	N	N	N	2.99	3.37

Source: Rail Transport Companies.

Note: Plywood Shipping Points:
Vancouver, B.C.
Portland, Oregon

Waferboard Shipping Points:
Mitsue, Alberta
Longlac, Ontario
Chatham, New Brunswick
Hayward, Wisconsin

N: Means not available or not meaningful.

TABLE 26

STRUCTURAL PANEL RAIL RATES FROM MAJOR SHIPPING POINTS TO PRINCIPAL MARKETS - UNITED STATES

($C/100 lbs.)

FROM	TO				
	Chicago	New York	Kansas City	Houston	Los Angeles
Vancouver	3.96	5.51	3.53	3.93	2.60
Mitsue	4.31	5.07	3.67	5.11	3.06
Longlac	2.25	2.04	2.84	4.10	6.25
Chatham	4.61	2.88	5.80	6.75	7.75
Hayward	1.21	3.69	1.59	2.46	4.11
Portland	3.85	5.73	3.46	3.83	0.93
Corrigan	2.85	3.91	2.19	0.43	4.17

Source: Rail Carriers.

Note: Plywood Shipping Points:
Vancouver, B.C.
Portland, Oregon
Corrigan, Texas

Waferboard Shipping Points:
Mitsue, Alberta
Longlac, Ontario
Chatham, N.B.
Hayward, Wisconsin

COMPETITIVE TRANSPORTATION RELATIONSHIPS (cont'd)

Predictably, Alberta shippers enjoy a rate advantage into prairie regions as well as into Vancouver. The Winnipeg market, however, represents the extent of favourable rates to the east from Alberta. To capture a share of the important markets of Toronto and Montreal would require accepting a transport reduction of approximately $2.60/100 lbs. This would be equivalent to a net mill reduction of approximately $35.00/1,000 sq.ft., 3/8" basis or 25% of estimated current manufacturing costs.

Until the recent construction of massive waferboard production capacity in Michigan, Minnesota, Wisconsin, and Idaho (represented by Hayward in the previous table) waferboard shipped from Alberta easily penetrated into almost all markets in the United States. The only constraint was competitive waferboard shipped from Central and Eastern Canada. It is clear, however, that in order to remain competitive in all major U.S. markets, except the South-West region, shippers from Canada will be obliged to accept mill returns adjusted to reflect relatively higher transport costs. Unquestionably, selected markets will still be accessible in the U.S. but servicing certain major consuming areas will require acceptance of lower mill returns.

Normally, markets in close proximity to plants are more efficiently serviced by road rather than rail and from time to time even distant markets can be reached more economically by road transport than by rail. Truck rates are shown in detail in Appendix 5 but do not significantly affect the conclusions drawn from the analysis based on rail rates.

COMPETITIVE TRANSPORTATION RELATIONSHIPS (cont'd)

Plywood has achieved wide-spread geographic market acceptance primarily because production is dependent on the supply of adequate quantities of peelable logs. These in turn have limited production to areas such as the Pacific Northwest and British Columbia, and latterly to plantation logs in the South Eastern U.S. Waferboard, on the other hand, although requiring roundwood (logs) for the production process can be manufactured from small, low-quality logs which are available on a wide-spread geographic basis, therefore providing the opportunity to produce waferboard in proximity to major market areas. For this reason, it appears logical to assume that waferboard distribution will be confined to regions close to the producing plants and will not attain, on a long-term basis, the same wide-spread distribution as has been achieved by softwood plywood.

This, in fact, has proven to be the case already with Alberta-produced waferboard becoming increasingly restricted to Western Canada and a dwindling number of U.S. carefully selected markets. To illustrate this point, very recently a subtantial market for Alberta-produced waferboard has been established in Alaska with material moving by rail to Prince Rupert, B.C. and from there by rail-car barge to Whitehorse for rail distribution in Alaska. Traditionally, supplies of structural panels have been shipped from Seattle but the rate from Seattle to Alaska has escalated to \$8.50/100 lbs. compared to \$5.50/100 lbs. from Alberta. Thus, despite a 10% duty waferboard can easily compete with U.S. produced panel products. It is generally recognized, however, that if Alaska develops into a major market for waferboard, a plant will be constructed either in B.C., close to the shipping port, or in Alaska. Both of these regions possess more than adequate supplies of suitable roundwood.

COMPETITIVE TRANSPORTATION RELATIONSHIPS (cont'd)

Regionalization of markets has always been a fact of life in the non-structural board industry. The value-to-weight ratio of particleboard and hardboard has consistently been very low and the distances over which these materials could be transported economically severely restricted. The exceptions are specialty items such as MDF and high-quality tempered hardboard which have much higher value-to-weight ratios than the standard board types. This does not mean, however, that an MDF mill would necessarily succeed in Alberta since the major Canadian market is East of the Great Lakes. The probability of a mill in Ontario or Quebec is high. The saving in freight cost compared to an Alberta location would be a critical factor.

One of the reasons for the consistency in low value is the fact that the non-structural panelboards may be produced from almost any fibrous material. This includes sawdust, shavings, furniture waste and any other residue resulting from a wood processing operation.

Additionally, although this is not a common practice, these boards can be produced from other fibrous material such as flax, wheat straw, sugar-cane and rice husks. In other words, possession of a large and economically exploitable timber resource is not necessarily a significant advantage relative to the non-structural panels.

As a result of the capability of utilizing any and all types of residue, production of the non-structural panels is not confined to specific areas as is plywood and to a lesser extent, waferboard, but is scattered over very wide areas.

COMPETITIVE TRANSPORTATION RELATIONSHIPS (cont'd)

Consequently, a detailed analysis of transport costs for these products from the large number of widely-scattered plants to the principal markets would be very time-consuming and is certainly beyond the scope of this study. The practicality of conducting a detailed study is also questionable since regionalization is an established feature of non-structural board trade and previous studies have shown that the demand in the area logically served by an Alberta based plant - Alberta, Saskatchewan and, to a lesser degree, Manitoba - is not at present sufficient to justify construction of a new non-structural board plant.

A map showing the location of key markets vs principal softwood plywood and waferboard shipping points has been compiled and is reproduced on the following page. The natural "corridor" for waferboard from Alberta is also noted. This corridor indicates the areas which at present could be serviced competitively from Alberta.

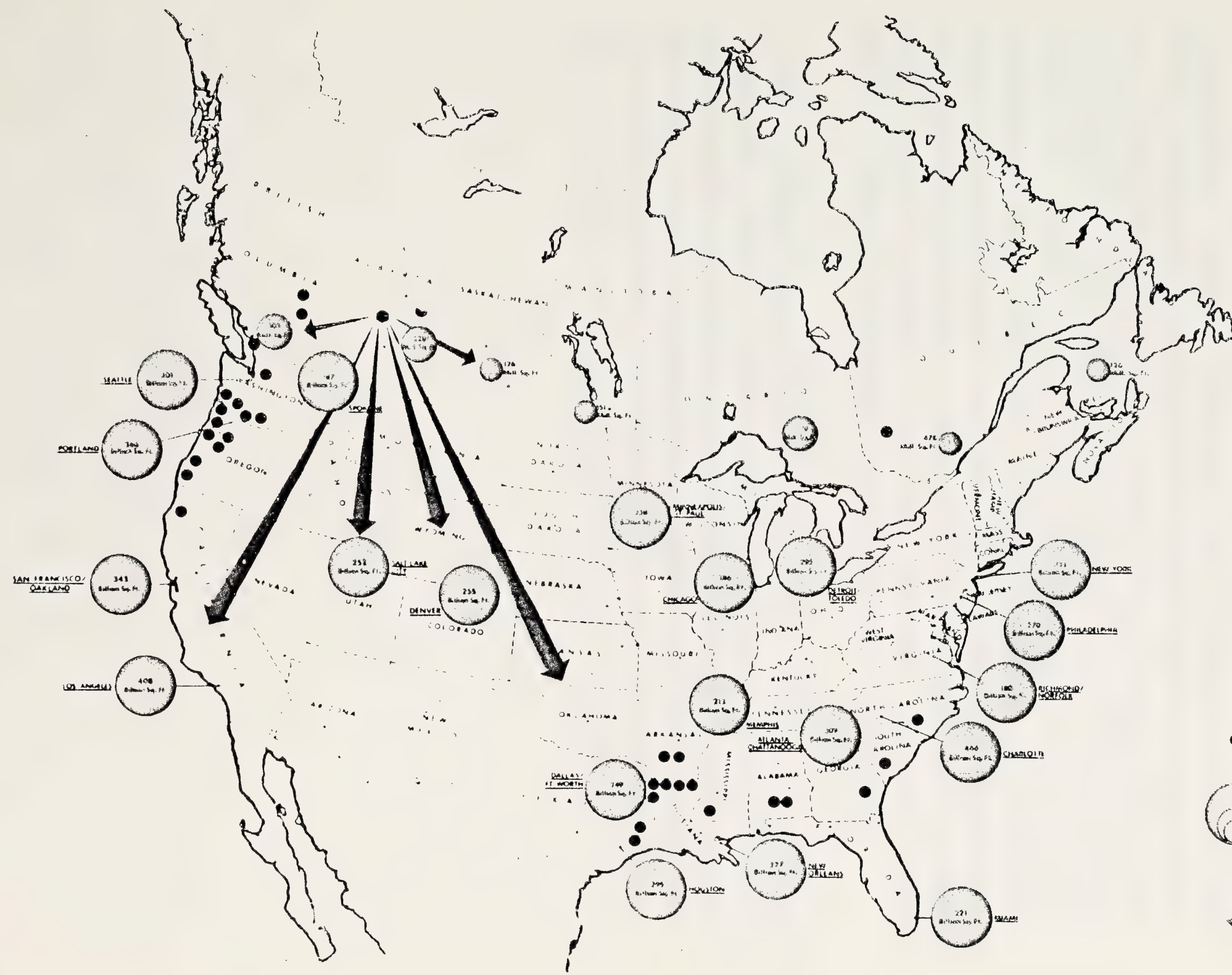

FIGURE 13

NORTH AMERICA

PLYWOOD & WAFERBOARD
PLANT LOCATIONS & MAJOR MARKET AREAS

(51) - PLYWOOD PLANTS

(1) - WAFERBOARD PLANT

MAJOR MARKET AREAS
(FIGURES INDICATE SHIPMENTS RECEIVED IN 1978 FOR STRUCTURAL PLYWOOD)

POTENTIAL MARKETS FOR ALBERTA PRODUCTS

CH ASSOCIATES INTERNATIONAL LTD.

MRH

AR

3101 1

SUMMARY

In summary, the influence of transport costs on the distribution of forest products has always been significant, but in recent years has become a critical factor in the distribution of panel products. This is particularly true of non-structural types. Plywood and waferboard, which are more demanding as regards wood furnish quality than are the non-structural types, are traded over correspondingly longer distances. Waferboard, however, will undoubtedly become less attractive as an investment potential in Alberta as the concept of "regionalization" results from new plant construction adjacent to the principal markets, and the availability of lower cost waferboard within easy shipping distance of markets will undoubtedly make plywood even less attractive.

It seems reasonable to conclude that for all the technical and transport considerations outlined in this and preceding sections, a major incentive to industry would be the provision of assurance of an adequate market for any panelboard. A further reasonable assumption appears to be that the major thrust of any market development work should be in regions of proven fibre deficiency. This, in turn, means overseas markets rather than North American.

PART IV - INDUSTRIAL DEVELOPMENT INCENTIVES

INTRODUCTION

The principal objective of this study was to determine the benefit, if any, which would accrue to Alberta through operation of the proposed development facility in Alberta. Almost as a corollary of this objective, suggestions were made by many interviewees regarding methods of inducing industry to increase efficient utilization of Alberta's poplar. This section of the report presents a review of the most reasonable suggestions together with the advantages and disadvantages of each.

Although a number of interviewees suggested that low-cost money would be an attraction, the number was surprisingly low and almost none of the major companies perceived low-cost money as a strong inducement to expand operations in Alberta. Most considered the benefits of low-interest funds to be too short-term in relation to plant operating life.

Suggestions made by the more experienced interviewees were subsequently discussed with other equally knowledgeable officials and unless a reasonable degree of unanimity of opinion was evident, the suggestion was not considered acceptable for inclusion in this report. In other words, the suggestions which will be reviewed in this section are considered by a number of interviewees as rational measures by which government could participate in expanding Alberta's poplar-based industry. Out of all of the suggestions made, four only met the criteria established and these are listed below:

1. Semi-Commercial Development Facility.
2. Pre-Development Assistance.
3. Standard Development Incentives.
4. Transportation Cost Equalization.

Each of these is discussed in the following sub-sections.

SEMI-COMMERCIAL DEVELOPMENT CENTRE

General

Under this concept, the proposed development facility would be expanded from panelboard development facility to full scale commercial production. In practical terms, the suggestion is that the press capacity be increased from the proposed single-opening to the number of openings required to provide a "balanced" plant. This probably means an increase to 7 or 8 openings with only minor additional expenditures required in the remainder of the proposed plant.

The expanded plant would still function as an R&D facility for industry and government use but could also function as a commercial plant selling in the open market. A further suggestion was that the output of the plant be used as the primary supply source for government controlled agencies such as the Alberta Housing Authority and the Department of Public Works.

Reasonable notice would be required for the plant to be made available for R&D use and the plant staff could also be made available on a contract basis. If, however, confidentiality was a primary concern, then the contractor could also provide the staff necessary to conduct the development work as well as leasing the facilities.

Although the overall concept was agreed to be worthy of serious consideration, less agreement was achieved on the operating procedures best suited to the concept.

One segment of interviewees believed that a government agency, such as the Research Council, should assume responsibility for plant operations while others believed private industry should operate the plant. In the latter case, proposals would be solicited from qualified companies to operate the plant under a contract or lease arrangement with provision made for sub-leasing to industry or to government to conduct R&D work.

General (cont'd)

As a compromise between government and industry, the suggestion was also made that a trade association such as the Western Plywood Manufacturers Association or the Vancouver based Council of The Forest Industries of B.C. should operate the plant.

Cost

On the assumption that the present single-opening press would be expanded to 6 or 8 openings, the additional capital investment would amount to approximately $2.5 million. This would include not only the press expansion but also more sophisticated controls, additional conveying and storage equipment and additional space requirements. Based on capital cost estimates of $7.5 million for the panelboard development facility this means that a 33% increase in capital expenditure would result in a 600 to 800% increase in capacity.

As a panelboard development facility, the facility would undoubtedly require continual government subsidy at times probably amounting to 100% of total annual costs. As a semi-commercial plant, the revenue from panel sales would certainly decrease the amount of subsidy required and it is conceivable that the plant, under favourable market conditions, could prove economically viable. A cost/benefit analysis is beyond the scope of this study but should be carried out if this suggestion is accepted for further analysis.

Advantages

The principal advantage is that the plant could become economically sound. A second major advantage, however, is that the scaled-up plant would provide much more reliable simulation of full-scale commercial production than would the panelboard development facility. Additionally, the larger production plant

Advantages (cont'd)

would provide a more realistic training facility for industrial job trainees as well as for management/research personnel.

Disadvantages

The political repercussions would have to be carefully evaluated. Although the suggestion received reasonable support from industry officials, few welcomed the possibility of subsidized competition. During average market conditions, the output of the scaled up plant would have little or no impact on the overall market, but during weak market periods, sales from the plant could become an irritant.

Problems may arise if a government subsidized plant sold its output in export markets. Anti-dumping and similar action could possibly result. The current dispute over Canadian lumber exports to the U.S.A. allegedly being subsidized is an example of the sensitivity of this issue.

A critical factor will also be the type of management selected. While a greater degree of industry co-operation may be secured through contracting either a qualified forest products company or trade association to operate the plant, the issue of confidentiality may act as a deterrent to the general use of the plant as an R&D facility by industry as a whole.

Comments

Despite the fact that a semi-commercial R&D facility was considered by a member of interviewees to be a more effective means of attracting industry to Alberta, none were of the opinion that either size plant would prove truly effective inducements. The strongest support for the concept came, predictably, from equipment suppliers and university personnel.

Comments (cont'd)

In summary, a logical conclusion appears to be that the semi-commercial plant would prove to be a more attractive investment economically and practically than the proposed panelboard development facility, but that neither would prove to be inducements to industry to increase utilization of Alberta's poplar.

PRE-DEVELOPMENT ASSISTANCE

General

This suggestion received wide-spread support and was considered by most interviewees to be an important element in attracting industry into Alberta. Under this concept, a "package" would be prepared by government agencies which would contain at least the following elements:

1. Reliable, current forest inventory data. This would include, for both coniferous and deciduous species, and for selected areas, total volumes of timber available, allowable annual cut, number of stems per acre, distribution by diameter and height classes, species density, degree and distribution of decay and a brief description of probable logging conditions. A schedule of stumpage fees, royalties, timber and land taxes, municipal and provincial taxes, etc. might also be provided.

2. The data in (1) should be related to potential industrial sites selected for proximity to raw material supply, the availability of road, rail, supply and maintenance services, labour availability, supply and cost of natural gas, power and water.

3. A number of logical industrial development alternatives based on the data assembled under (1) and (2) above to be presented. These would be on a preliminary basis only but would provide a clear definition of suitable manufacturing plant configurations.

4. The "package" would also offer to potential developers assistance in obtaining the myriad permits, licences and agreements required by various provincial and federal agencies. This assistance would be available from the preliminary investigation phase and continue through the life of the project even after production commences.

General (cont'd)

5. A critical element in the "package" would be the identification of markets for the products selected. This market summary would extend to the identification of potential buyers in each market area selected. Methods of transport and other physical distribution mechanics would be outlined and a probable net mill sales return estimated. Detailed sales information would be essential since most interviewees expressed concern regarding the marketability of panel products manufactured in commercially acceptable volumes in Alberta.

Several states in the U.S. provide a service somewhat comparable to the service suggested here but to the best of Carroll-Hatch's knowledge no state or province provides a comprehensive industrial development program. Point (4) - assistance in conforming to rules, regulations and procedures - was mentioned by almost all forest products companies as well as equipment and material suppliers. The time and cost required by a potential developer in: (a) becoming aware of all of the rules and regulations and: (b) complying with and obtaining the necessary approvals and licences was noted repeatedly as one of the major inhibitors to any industrial development. The principal concern was not with the need for such regulations but rather with the overlap which occurs between government agencies and the resultant complexity of obtaining the required clearances to proceed with a project. The availability of knowledgeable assistance from a single, central source in dealing with the various regulatory agencies was considered to be an extremely effective device for attracting attention to Alberta's development potential and would be an essential element to any pre-development package.

Point 1 - i.e., the provision of reliable, current, comprehensive forestry data, was noted as being a key requisite for attracting forest-based industry to Alberta by almost all of the forest company officials interviewed. The lack of inventory data was cited as one of the major problems encountered by potential investors not only in Alberta but in every province in Canada. Availability of

General (cont'd)

this data would therefore provide Alberta with a distinct advantage in attracting forest-based investment capital. This would be highly effective in discussions with foreign investors who will probably show increasing interest in Canada as a source of economically priced wood.

Points 2, 3 and 4 are self-explanatory and, when related to the data described in Point 1, would comprise an industrial presentation which all interviewees believed would place Alberta in a very strong (and unique) position to attract industry into the province.

Cost

The cost of assembling the total package would not be insignificant but would depend on the depth of presentation undertaken. The recommendation was made that the analysis for the presentation be carried out in sufficient depth to provide a high degree of credibility to the results. The most costly portion of the package would be the analysis of the forest resource and this could be brought to reasonable levels by restricting detailed forest inventory analysis to carefully selected areas and not attempting to survey the entire forest base.

Advantages

If accepted and implemented, this suggestion would provide Alberta with what is considered to be an essential element to forest-based industrial development. Further, Alberta would be unique in being able to provide such a comprehensive package.

Advantages (cont'd)

After assembly of the required information and of the final presentation material, administering the program would be reasonably simple and would not require a large staff. Besides staff salaries and overhead, the only operating expense would be a travel and advertising/promotion budget which would not need to be excessive.

This concept also offers the advantage of being completely under government control both in development and implementation, does not intrude in any area of concern to private industry and can not be reasonably criticized as unfair government subsidy by national or international agencies or companies.

Disadvantages

Although considered to be an effective means of focusing attention on Alberta's forest resource and of removing many of the existing obstacles to industrial development, the suggested package would not guarantee poplar-based industrial expansion in Alberta. Additionally, the information contained in the package would require consistent up-dating albeit not on an annual basis.

Comments

This concept received the most wide-spread and enthusiastic support. The problems which would be addressed in compiling the package would be the same problems faced by any private investor, and the ready availability of solutions to those problems is seen as an attraction for meaningful investment. Additionally, although the extent of government participation (expenditures) would be fairly significant, this participation would not be in the form of direct subsidization therefore would not be likely to attract anti-dumping or other retaliatory measures from other regions.

STANDARD DEVELOPMENT INCENTIVES

General

Standard development incentives refers to the more or less standarized industrial development incentives currently available in each of the provinces. In general, funding and/or management assistance available under these programs is offered either by provincial agencies or under joint federal/provincial agreements. Most of the provincially funded programs are directed to small-business assistance and the joint federal/provincial programs are structured towards major industrial development.

A general awareness of the existence of the provincially funded industrial incentives was apparent but interviewees were more knowledgeable regarding federal/provincial funding programs - in particular the DREE agreements - than with provincial programs.

It is not the intent to present a detailed analysis of the various programs offered by each province but it is apparent that within reasonable limits the advertised provincial programs display a remarkable similarity in both the amounts offered either as a low-interest and/or forgivable loans or as a direct grant. This similarity extends both to the upper funding limits and to the procedures to be followed in order to secure financial assistance.

Quebec appears to be the exception to the general rule in that Quebec has traditionally provided a much higher level of large-scale industrial financing than the other provinces. This disparity may be attributed to: 1) a very beneficial relationship with the Federal government - DREE in particular, 2) an aggressive approach to soliciting new industry, and 3) direct participation by a provincially controlled Crown Corporation (Rexfor) in industrial developments either as a senior or junior partner.

The results of Quebec's philosophy and aggressiveness are clearly evidenced by the data in Table 27.

TABLE 27

DISTRIBUTION OF DREE FUNDS

vs POPULATION DISTRIBUTION - 1980

($ millions)

Area	Sub-Agreements	Industrial Incentives	All Other	Total	Percent Dist. DREE	Percent Dist. Population
Maritimes	133.7	28.1	39.3	201.1	33.6	9.4
Quebec	94.4	64.0	9.2	167.6	28.0	26.2
Ontario	27.0	5.2	2.4	34.6	5.8	35.7
Manitoba	20.9	9.7	27.2	57.8	9.7	4.3
Saskatchewan	12.2	6.4	58.1	76.8	12.8	4.0
Alberta	7.6	2.2	7.9	17.7	3.0	8.9
B.C.	30.1	2.1	6.3	38.5	6.4	11.2
Yukon & N.W.T.	1.8	0.1	2.3	4.2	0.7	0.3
Total	327.7	117.8	152.7	598.3	100.0	100.0

Source: DREE Annual Report and Statistics Canada.

General (cont'd)

Analysis of other years reveals much the same distribution pattern as in 1980. Both the Maritimes and Saskatchewan received a major portion of total grants under a long-established agriculturally-oriented federal/provincial program entitled "Funds for Rural Economic Development Act" which excludes industrial development funding. Of the funds obtained for industrial investment, Quebec accounted for over 50% of all Industrial Incentive and almost 30% of all Sub-agreement funds.

In addition to the ability to secure significant amounts of federal funds to assist in broadening Quebec's industrial base, the Province, after certain criteria are satisfied, will make direct grants available to new industries and these grants are to be applied against mortgage interest payments for up to 5 years or a maximum of $6 million. In all, Quebec, in one form or another, has in-place in excess of 100 industrial/business incentive programs.

To assist in implementing these programs, Quebec maintains a consistent, aggressive promotional campaign. In addition to the normal advertising and publication of brochures, personal contact with potential investors in North America and Europe constitutes a key element in this campaign. The contact is normally initiated by representative of Quebec's industrial development department some of whom are stationed in major cities in Europe. Follow-up by personal contact in whatever province or region is convenient for the potential investor is standard procedure when those contacts are considered promising.

To summarize, except for the Maritimes and Quebec, most provinces maintain reasonably similar industrial/business incentive programs. Quebec obviously assigns a high priority to incentives for industrial development while the Maritimes are recognized as a chronic high unemployment area and the apparently disproportionate amount of federal funds expended in the region is understandable and more or less accepted.

Cost

The cost of an expanded industrial incentive program in Alberta is impossible to predict since the scope of the program would have to be first decided and this would be a political decision. Provincial industrial/business incentive expenditures actually undertaken by Alberta in 1981 were reported to amount to less than $100,000.00.

Advantages

An expanded, vigorously promoted industrial incentive program would be readily understood and accepted by industry and would possess the added advantage of providing the opportunity of establishing limits to government participation in new developments. Participation by government agencies also provides the opportunity to review and evaluate the feasibility of proposed new enterprises.

Disadvantages

Generating retaliatory action by other provinces may be a possible disadvantage. Quebec appears to be considered an exceptional case and most actions undertaken by the government of Quebec do not appear to generate noticeable response from the other provinces. Whether this attitude would extend to an accelerated, aggressive industrial incentive program initiated by the government of Alberta is open to question. The cost of administering an expanded industrial development program is also a disadvantage. The size and qualifications of the staff required would depend on the scope of the program decided on but it should be noted that one of the key elements to Quebec's successful program is the availability of adequate numbers of qualified personnel to both initiate developments and to provide follow-up.

Disadvantages (cont'd)

A significant disadvantage and one which applies to all government incentives is the fact that many projects are initiated which without government assistance, are not viable in themselves. Subsequently they often prove uneconomical and move into bankruptcy.

Comments

Direct or indirect government industrial incentives are probably the most wide-spread and well-understood methods of encouraging industrial expansion. The effectiveness of this method in increasing utilization of Alberta's poplar resource will undoubtedly be related to the resolution of several other related factors. These include the availability of accurate forest inventory data, availability and relative costs of services and labour and market accessibility. In other words, even a vigorously undertaken program of increased government incentives would probably not prove successful unless supported by thoroughly prepared background information on Alberta's forests and relative market position for each major product category.

TRANSPORTATION COST EQUALIZATION

General

As shown in the transportation section of this report, because of Alberta's location relative to many major Canadian and U.S. markets the cost of transporting finished panel products to market is significantly higher from Alberta than from competing regions, particularly for the reconstituted wood panels. To illustrate this point, rail transport costs for waferboard from Slave Lake are compared in Table 28 with those from Long Lac, Ontario, into the Toronto and Montreal market areas.

TABLE 28

WAFERBOARD TRANSPORTATION COSTS - FEBRUARY 1982

($/1,000 sq.ft. - 3/8")

	To	
From	Toronto	Montreal
Longlac	15.00	18.00
Mitsue	49.00	49.00

Source: Rail Transport Co's. and C-H.

Note: Above costs based on waferboard weight of 1,300#/1,000 sq.ft. - 3/8" and rail rates of $3.76/100# from Mitsue and $1.18 and $1.37/100# Longlac to Toronto and Montreal.

General (cont'd)

It is apparent that, under the current rail rate structure, in order to be competitive, material would have to be shipped from Alberta at a selling price approximately $33.00 per 1,000 sq.ft. - 3/8" lower than that from Eastern Canada. Present mill sales prices are reported to be $120.00 per 1,000 sq.ft. - 3/8" (less than break-even reportedly) therefore the loss imposed by transport adjustment amounts to approximately 28% of the mill sales price.

This differential varies between markets and, of course, for most Prairie markets, Alberta-based producers enjoy a freight cost advantage.

Precise data on the total annual cost of transporting panel products to market from Alberta are not readily available, but an average cost of $3,000.00 [1] per rail car is reported to be a reasonable estimate. For a standard sized waferboard plant operating at full capacity this would amount to a total of approximately $4 million per year. To provide perspective, this amount is approximately equal to the cost of wood (highest cost item) in total waferboard manufacturing costs. Despite the preliminary nature of these estimates it is apparent that transport costs are a vital consideration in any economic feasibility analysis and are likely to become even more important in the future.

For this reason, many interviewees in all regions, including Eastern Canada, suggested that some form of transport subsidy, made available to Alberta producers, would be an attractive inducement to potential investors to locate in Alberta. Precedent does exist in Canada. The Maritime Freight Act, which has been in effect since 1969, provides a subsidy to shippers from all the maritime provinces into any part of Canada. The effects of this Act vary with distance shipped but, in general, rates are reduced approximately 25%, 20%, and 7% for shipments into Montreal, Toronto, and Western Canada respectively.

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1. Adjusted for estimated proportions shipped by truck.

General (cont'd)

As an example of the effect on panelboard products the rate on waferboard from Chatham, New Brunswick to Montreal (850 miles) is currently $1.03/100 lbs. compared with $1.40/100 lbs. from Longlac, Ontario to Toronto (550 miles).

Cost

Obviously, the direct cost of this suggestion will depend entirely on the degree of subsidization decided on. For the present panelboard industry in Alberta, direct subsidy payments would range from $1,000,000 to $4,000,000 in order to be meaningful. The "hidden" costs, i.e., adminstration and data assembly are very difficult to predict. Undoubtedly, however, these costs will be very high and could easily exceed the direct costs. Much more research is required before definitive cost projections could be reliably developed.

Advantages

The main advantages of a transport subsidy are that it is easily understood and communicated and that it is directed at one of the major (and growing) obstacles to industrial development in Alberta. The availability of a transport subsidy is regarded by most interviewees as a strong inducement to forest products companies to expand their activities in Alberta. It was generally agreed that reducing the negative effect of transport costs on the economic viability of manufacturing units in Alberta would certainly encourage the construction of poplar-based conversion units in Alberta.

Disadvantages

The most obvious disadvantage, other than the direct cost, is the one of administering any freight subsidy program. Verifying actual shipments and costs, preparing rebates or some form of discount presents formidable and complicated problems. If agreement is reached with the carriers for reduced rates to be applied to shippers, with the balance provided by the Alberta government, then staff and procedures would have to be established to permit identification of each shipment by shipper, destination, actual (true) costs and amounts paid by shipper. This would apply to truck as well as to rail shipments since any subsidy program would have to include road transport in order to avoid possible unfair practices charges.

If the subsidy or rebate is to be paid directly to the shipper, then staff and methods must be installed to assemble and verify all shipping data including destination and costs.

In addition to the complex administration procedures which would become essential, a transport subsidy program would undoubtedly generate acute political problems. One of the most serious would be the reaction of the forest products industry in the U.S. which would undoubtedly raise the issue of violation of trade agreements on shipments to the U.S. At the very least, U.S. customs would undoubtedly apply duty charges against the amount of subsidy provided to the shipper. This is the procedure followed under the Maritime Freight Act. Preparing the necessary documentation would undoubtedly prove expensive and time-consuming.

If the decision is made to restrict subsidy payments to Canadian shipments, the reaction of other provinces would have to be considered. At the moment, with the exception of the Maritimes, no other region in Canada enjoys transport subsidies for manufactured forest products. The reaction to the introduction of subsidies in Alberta is unpredictable but it seems reasonable to assume that other provinces would be pressured into instituting similar programs and any advantage Alberta gained would be temporary only.

Comments

Although, as a device for attracting industry, a transport subsidy program in Alberta would probably prove to be very effective in the short-term (5 to 10 years), over the long-term the effectiveness would diminish as other regions retaliated with similar programs. A violent reaction from the U.S. industry would undoubtedly occur for shipments into the U.S. and this would likely result in the imposition of tariffs or quotas thus negating the competitive edge provided by a transport subsidy to Alberta shippers.

A substantial investment would be required to administer a subsidization program and the resulting administrative staff would require a substantial operating budget.

On balance, despite the apparent attractiveness and simplicty of a transport subsidy program, the disadvantages appear to outweigh the advantages. If the decision is taken to proceed further on the question of a transport subsidy a detailed analysis of all aspects, political as well as economic should be carried out before a final decision is made. This analysis should include the effects of incoming transport costs as well as outgoing since most interviewees believed that Alberta's location relative to suppliers of materials, machinery and equipment generate incoming transport costs which are higher than those in competing areas.

BIBLIOGRAPHY

1. American Plywood Association 1980. Regional Production & Distribution Patterns of the Softwood Plywood Industry.

2. Data Resources Inc. Forsim Revue. Lumber and Panel Markets through 1995.

3. Department of Forestry. The Use and Production of Construction Grade Plywood in Canada 1968.

4. Department of Regional Economic Expansion. Annual Report 1980-1981.

5. Environment Canada: R&D in Solid Wood Products - V.N.P. Mathur.

6. Food and Agriculture Organization of the United Nations, 1969 and 1979. Yearbook of Forest Products.

   United States Department of Agriculture, Forest Service, 1981. An Analysis of the Timber Situation in the United States, 1952 - 2030.

7. Forintek Canada Ltd. 1980 Canadian Waferboard Synposium Proceedings.

8. Government of Canada - Forestry Service. Growth and Utilization of Poplars in Canada - 1968.

9. Governments of the Province of Saskatchewan, Alberta and British Columbia. The Non-Tariff Barrier Codes in The Multilateral Trade Negotiations - 1978.

10. Lamb Guay Inc. Outlook for the Canadian Decorative Panel and Component Business 1977 - 1982.

11. Industry, Trade & Commerce. Multilateral Trade Negotiations Canadian Particaption 1979.

12. Maloney M. Thomas. Modern Particleboard and Dry-Process Fibreboard Manufacturing.

13. Statistics Canada: Manufacturing Industries of Canada: National and Provincial Areas - 1979.

    Catalogue 36-003 Particleboard & Waferboard.
    Catalogue 35-001 Construction Type Plywood.
    Catalogue 36-001 Hardboard.
    Catalogue 36-002 Rigid Insulating Board.
    Catalogue 65-007 Imports by Commodities.
    Catalogue 65-004 Exports by Commodities.
    Catalogue 65-003 Exports by Countries.
    Catalogue 65-006 Imports by Countries.
    Catalogue 35-205 Sash, Door and other Millwork Plants.
    Catalogue 35-206 Veneer & Plywood Mills Annual.
    Catalogue 35-208 Miscellaneous Wood Industries.
    Catalogue 64-002 Housing Starts & Completion.
    Catalogue 91-201 Estimates of Population for Canada & the Provinces.

BIBLIOGRAPHY (cont'd)

14. United Nations Economic Commission for Europe. Timber Committee. Synposium on Wood-Based Panels in the 1980's Helsinki.

15. National Particleboard Association. Particleboard & Medium Density Fibreboard Annual Production - 1980.

APPENDIX A-1

TERMS, ABBREVIATIONS, UNIT CONVERSIONS & REGIONAL DEFINITIONS

APPENDIX A-1 - TERMS, ABBREVIATIONS, UNIT CONVERSIONS & REGIONAL DEFINITIONS

TERMS:

$Can. or #C.	-	Canadian Dollars
cu.ft.	-	Cubic Feet
cunit	-	100 cubic feet
etc.	-	And so on
i.e.	-	For example
m^3	-	Cubic Metres
mm	-	Millmetres
M	-	1000
N/A or N	-	Not Available or Insignificant
%	-	Percent
lbs. or #	-	Pounds
sq.ft.	-	Square Feet
vs.	-	Versus

ABBREVIATIONS:

C.O.F.I.	-	Council of Forest Industries
C.S.A.	-	Canadian Standards Association
C-H	-	Carroll-Hatch (International) Ltd.
Co's.	-	Companies
D.R.I.	-	Data Research Incorporated
D.R.E.E.	-	Department of Regional Economic Expansion
Dist.	-	Distribution
E.F.T.A.	-	European Free Trade Association
E.E.C.	-	European Economic Community
F.A.O.	-	Food & Agriculture Organization of the United Nations

APPENDIX A-1

ABBREVIATIONS: (cont'd)

F.O.B.	-	Free on Board
G.A.T.T.	-	General Agreements on Tariffs and Trade
G.N.P.	-	Gross National Product
incl.	-	Including
L.V.L.	-	Laminated Veneer Lumber
Ltd.	-	Limited
M.D.F.	-	Medium Duty Fibreboard
N.W.T.	-	Northwest Territories
O.S.B.	-	Oriented Strand Board
R&D	-	Research and Development
S.R.I.	-	Stanford Research Institute
U.S.A. or U.S.	-	United States of America
U.S.F.S.	-	Unites States Forest Service
U.S.S.R.	-	Union of Soviet Socialist Republic

UNIT CONVERSIONS:

1 m^3	=	35.314	cubic feet
		423.768	sq.ft. of 1" thick boards
		565.024	sq.ft. of 3/4" thick boards
		678.029	sq.ft. of 5/8" thick boards
		847.536	sq.ft. of 1/2" thick boards
		1130.048	sq.ft. of 3/8" thick boards
		3390.144	sq.ft. of 1/8" thick boards
1 cm	=	.3937 inches	
1 m	=	39.37 inches	

APPENDIX A-1

REGIONAL DEFINITIONS:

North America

Canada
United States

Europe

Western Europe
Eastern Europe (Less U.S.S.R.)
Scandinavia

U.S.S.R.

Latin America

Argentina
Brazil
Chili
Colombia
Guatemala
Peru
Venezuela

Africa

Asia (Less Japan)

Japan

APPENDIX A-1

REGIONAL DEFINITIONS: (cont'd)

Oceania

Australia
New Zealand

APPENDIX A-2

LIST OF INTERVIEWEE COMPANIES & ORGANIZATIONS

APPENDIX A-2 - LIST OF INTERVIEWEE COMPANIES & ORGANIZATIONS

INTRODUCTION

The listing of groups interviewed has been segregated into Western Canada, (B.C., Alberta, Saskatchewan, Manitoba), Eastern Canada (remainder of Provinces) and the United States.

More than one interview was conducted with vertically-integrated companies such as M&B, Weldwood, etc. and in such cases the total number of interviews is shown in brackets.

In all, 203 interviews were conducted of which an estimated 90% were face-to-face the remainder being conducted by phone.

The degree of co-operation received was extremely high despite the fact that the current recession was causing grave concern and most private sector interviewees were convinced the recession would continue for at least another year.

In summary, the C-H interviewers (5) believe that the results of the interviews were more than satisfactory and provided enough information to permit valid conclusions to be drawn.

APPENDIX A-2

WESTERN CANADA

Forest Products Companies (Manufacturers)		Wholesale, Distributor, Retail	
Alpine Veneers		ALA Limited	(2)
B.C. Forest Products	(2)	Alpine Forest Products	
Building Products		Beaver Lumber	(2)
Canadian Forest Products	(5)	Canadian Forest Products	(2)
Cantree		Canusa	
IKO		Hollyburn Lumber	
MacMillan Bloedel	(2)	Hometown	
Northwood Mills Ltd.	(2)	Nelson Lumber	
Pelican Spruce		Weldwood	(4)
St. Regis			
Saskatchewan Forest Prods.	(2)		
Weldwood	(6)		
Zeidler Forest Products			

Note: Numbers ( ) refer to separate interviews held with divisions or branches of multi-unit companies.

APPENDIX A-2

WESTERN CANADA (cont'd)

Equipment and Material Suppliers

Borden Chemical
Burrard-Yarrows
CAE
Can-Car Pacific
Durand Machinery
Lamb-Cargate
Lochead-Haggerty
Mainland Mfg.
Pallmann (Canada)
Precision Engineering Services

(2)

Fabricators

Atco
Cairns Homes
Crestwood Kitchens
Engineered Homes
Kroehler
Nelson Lumber
Palliser Furniture
Truss Joist

Research & Development

Council of Forest
Industries-B.C.
Forintek
University of B.C.

Associations

Alberta Forest Products Assoc.
Council of Forest Industries of B.C.

APPENDIX A-2

WESTERN CANADA (cont'd)

Governments

Alberta:

- Economic Development
- Forest Service
- Research Council

British Columbia - Ministry of Industry and Small Business

Manitoba - Industrial Development

Saskatchewan - Industry and Commerce

Consultants/Architects

Chandler-Kennedy
Columbia Engineering
D. Hodgkinson
Hallmark
Rhone & Morton
Simons International

APPENDIX A-2

EASTERN CANADA

Forest Product Companies (Manufacturers)		Wholesale, Distributor, Retail	
Burchill Plywood		Beaver Lumber	(3)
Commonwealth Plywood		Kefor	
Domtar	(2)	Lansing Buildall	
Flakeboard		Levesque Plywood	
Forex-Leroy		Lumberking	
Grant Waferboard		Lumberland	
Levesque Plywood		Meteor Plywood	
MacMillan Bloedel	(4)		
Masonite of Canada			
Nordfibre			
Normick-Perron			
Northwood Mills	(4)		
Rexfor			
Rexwood			
Waferboard Corpn.			

Equipment and Material Suppliers	Fabricators
Borden Chemical	Artistic Woodwork
Dow Chemical	Bendix Trailer
Pathex	Biltrite Furniture
Reichhold Chemical	Braemore Furniture

APPENDIX A-2

EASTERN CANADA

Reasearch and Development

Abitibi Research
CMHC (2)
Domtar
Forintek
HUDAC
National Research Council-DBR
Noranda
Underwriters Laboratory of Canada
University of New Brunswick
University of Toronto

Fabricators (cont'd)

Cayouette Ltee.
Colonial Homes
Electrohome
Ford of Canada
General Motors
Glendale Trailer
Global Upholstery
Goldcrest Furniture
Hanover Kitchens
Hunter - Douglas
Intercraft
Kenden Millwork
Kroehler Furniture
Miller Mobile Homes
Muttart
National Steel Car
Okaply
Paris Kitchens
Premium Doors
R&B Trailer
Sklar Furniture
Thomas Furniture
Viceroy Homes
Wilson Display

APPENDIX A-2

EASTERN CANADA

Governments		Consultants
Canada - DITC	(3)	Forestal
New Brunswick-Economic Dept.		Klockner, Stadler, Hurter
Nova Scotia-Dept. of Development		SNC Cellulose
Ontario-Dept. of Industry & Commerce		
- Lands and Forests		
- Ontario Development Corporation		
Quebec - Ministry of Commerce		

Associations

Can. Particleboard Assoc.

Can. Waferboard Assoc.

APPENDIX A-2

UNITED STATES

Forest Product Companies (Producers)

Georgia-Pacific	(2)
International Paper	(2)
Potlatch Timber	
Publishers Paper	(3)
Simpson Timber	
Weyerhaeuser	

Wholesale/Distributor

Champion-International	(2)
Georgia-Pacific	
International Paper	
Publishers Paper	

Equipment

Bison-Werke
Coe Mfg.
Globe
MEC
Pallmann - U.S.A.
Siempelkamp
Washington Iron Works

Research and Development

Champion-International	(2)
USFS-Forest Products Lab.	(4)

Associations

American Plywood Association
National Particleboard Assoc.

APPENDIX A-3

DESCRIPTIONS OF PANEL PRODUCTS

APPENDIX A-3 - DESCRIPTIONS OF PANEL PRODUCTS

INTRODUCTION

The following are the current members of the family of panel products. A brief description of each is presented in the following pages. There are many sub-groups of each panel type but no useful purpose would be served by also describing these sub-groups. Therefore only the major categories are included.

The members are:

- Plywood
- Waferboard
- Oriented Stand Board
- Particleboard
- Fibreboard
- Laminated Veneer Lumber
- Veneer

PLYWOOD

Plywood is a composite panel or board made of cross-banded layers or plies of veneer [1] bonded with an adhesive [2]. Generally the grain of one or more plies is at right angles to that of the other plies and almost always an odd number of plies are used. Veneer bonded to a core of solid lumber or particleboard is also referred to as plywood.

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1. Veneer is described later.

2. For structural grade plywood (wall and roof sheathing, concrete form work and other exterior applications) the adhesive is almost always phenol-formaldehyde with additives and extenders blended in. For interior grade plywood (some poplar and a significant portion of U.S. softwood plywood production) the adhesive is usually urea-formaldehyde with additives.

APPENDIX A-3

PLYWOOD (cont'd)

The term plywood usually refers to products made solely from wood veneers. For purely structural uses, such as wall sheathing, plywood made from softwood species is the generally accepted type. Panels made from all poplar veneers or poplar veneers combined with softwood species are also accepted for structural use. Normal thicknesses range from 1/4" to 1".

For decorative purposes plywood made from thin hardwood veneers ranging from 1/16" to 1/64", of birch, maple, oak, etc. is commonly made in the thickness range of 1/8" to 1/4" (for doorskins or wall panels) and up to 1" for cabinets, etc. Frequently, this class of panel contains a particleboard or solid lumber core and is most often bonded with urea-formaldehyde (non-waterproof) adhesive.

CSA standards 0121-M, "Douglas Fir Plywood"; 0151-M, "Canadian Softwood Plywood"; 0153, "Poplar Plywood" and 0115, "Hardwood Plywood" regulate production of plywood in Canada.

WAFERBOARD

Waferboard is a sheet material made from wafers which resemble small pieces of veneer. The wafers are 37 - 75 mm (1.5-3 in.) along the grain, an average of 0.5-1 mm (0.020-0.025 in.) thick, and of random width. Waferboard is a type of particleboard, since the wafers are a type of wood particle, and is pressed into a panel by a technology similar to that of particleboard. However, it is a quite distinctive product, in both its properties and uses.

The wafers are cut from 0.6 m (2 ft.) long, or longer, roundwood bolts, mostly from poplar, by waferizing machines. The cutting action is similar to that of a veneer slicer.

APPENDIX A-3

WAFERBOARD (cont'd)

Dried wafers are blended with a finely powdered phenol-formaldehyde resin and formed into a mat which is pressed at high temperature and pressure to a density of 0.65 (about 42 lbs. per cubic foot).

The finished panel is "waterproof" and usable in exterior applications where exposure to high humidity is a factor. Major uses are for roof and wall sheathings and general utility purposes, in other words, in direct competition with structural grade plywood.

The major difference between particleboard and waferboard lies in the size and geometry of the basic wood fibre furnish and in the type of adhesive used. Most particleboard is produced with urea-formaldehyde as the binding agent (interior use only) and waferboard's bonding is provided by phenol-formaldehyde resin (waterproof for exterior applications).

CSA standard 0188.2 M 78 applies to waferboard produced in Canada.

ORIENTED STRAND BOARD (OSB)

This multi-ply, layered panel is made by first producing long, thin flakes called "strands" (2 to 3 inches long) which are aligned more or less parallel to the long direction of the face and back plies of the panel while the core ply strands are aligned at right angles to the outer plies. Physical properties eg., strength, stiffness and dimensional stability of the panel are improved by this assembly.

Two Canadian waferboard mills have installed strand producing equipment to enable them to produce OSB as the market demands.

APPENDIX A-3

ORIENTED STRAND BOARD (OSB) (cont'd)

OSB is simply a modified waferboard panel and will compete directly with waferboard and structural plywood for the same end-use markets. The question of both production costs (thus selling price) and performance characteristics of the three products will determine the ultimate winner.

PARTICLEBOARD

Particleboard is a generic term for a panel manufactured from lignocellulosic materials - commonly wood - essentially in the form of particles produced by mechanical means such as chipping, flaking, hammermilling, etc. as distinct from fibres which are made by refining. The material may be from roundwood or by-products of other processes eg., shavings which are broken down into a random mixture of various shapes and sizes but all of which are elongated compared to their thickness.

Most particleboard is made in a thickness range of 1/2" - 3/4" with a density range of 40 - 45 lbs. per cubic foot (some is made at 28 lbs. for door cores). Recently, the introduction of press systems designed to make panels economically in the 1/8" - 1/4" range has brought about the term "thinboard". This class of particleboard is similar to the standard panel in all respects except the average thickness range and, usually, higher densities.

Particleboards are used for a wide range of applications but since they are non-waterproof are generally used in protected applications. The major use is in furniture and cabinet making where several types of finish may be applied.

CSA standard 0188.1 M 78, "Interior Mat-Formed Wood Particleboard" applies.

APPENDIX A-3

FIBREBOARDS

The description "fibreboard" is a generic term for panels manufactured primarily from interfelted lignocellulosic fibres (usually wood) made by either pressure refining or grinding and then consolidated under heat and pressure in a hot press. The pressing may be either by a "wet" process in which the fibres are carried in an aqueous suspension and pressed in the wet condition or "dry" process in which the fibres are dried before pressing. The greatest part of the bond results from the interfelting of the fibres. All production in Canada and virtually all in the U.S. is by the wet process method.

Three types of fibreboards are recognized, generally classified by density range:

(a) Hardboard:

Fibreboard produced to a density of 497 kg/m^3 (61 lbs. per cu.ft.) or greater. Described also as "compressed fibreboard" in international publications. "Masonite" is a typical example. A minimal amount of phenolic resin is added before pressing.

(b) Softboard:

Fibreboards pressed to densities less than 31 lbs./cu.ft. Also called "insulation board" in North America and "non-compressed fibreboard" internationally. This is sometimes impregnated with asphalt for wall sheathing uses. Ceiling (or acoustic) tiles are becoming the major products of the softboard group. Generally, starch is used as a binder in these.

There are no CSA standards for these products which are generally regulated by Canadian Government Specifications Board requirements.

APPENDIX A-3

FIBREBOARDS (cont'd)

(c) Medium Density Fibreboard (MDF):

This product is a fibreboard made by the dry process with the addition of about 10% of resin and compressed to a density range of 45 -55 lbs. per cu.ft. The panel is typically smooth and even-textured with excellent edge and machining properties and may be used as a core panel or as a substrate for direct printing and finishing. There is, currently, no production of MDF in Canada. A key element in the production process is the use of a pressurized (usually steam under pressure) refining system to produce the "slurry" which is then flash-dried prior to blending and pressing.

COMPLY

Comply is a three ply panel made with a core of wood strands aligned at right angles to the face and back which are made from wood veneer. In effect, the comply panel is manufactured using a combination of particleboard and plywood manufacturing techniques. The particleboard element forms the core and the plywood element is provided by bonding the face and back veneers to the core. Particles or fibres in the core may be either randomly or directionally oriented. Production of comply has been confined to the U.S. and in the U.S. has been confined to two companies. One new plant was scheduled to commence operations in the latter part of 1981, but start-up has been delayed. In any event, comply represents the type of long-range product and market development program which can be sensibly undertaken only by major-sized forest products companies.

APPENDIX A-3

LAMINATED VENEER LUMBER (LVL)

Laminated veneer lumber is produced by first cutting relatively thick veneers - up to 1/4" approximately - drying and then pressing them with water-proof adhesive with the grain of each veneer lying parallel to the long axis of the panel. Panels may be any thickness but to date most have been produced up to 2" thick. The panel is then sawn (ripped) to produce composite lumber sections such as 2" x 4". In the process, defects in the veneer may be cut out so that short veneers may be end butted and glued while being incorporated into the basic panel which may be up to 4' x 8' in overall dimensions.

Laminated veneer lumber which has been manufactured from Alberta's poplar/aspen species has proven to be exceptionally stable under changes of moisture content (almost no twisting or warping) and variations in strength characterisitcs from piece to piece have been found to be substantially less than solid lumber. This performance characteristic permits the use of relatively high working stresses so that poplar-based LVL can be used as a substitute for solid lumber from species such as Douglas Fir or Spruce.

VENEER

Veneer generally is the product of a peeling action in which a log is rotated about its horizontal axis in a lathe against a specialized fixed knife running the length of the log. The wood material comes off in thin sheets ranging from 1/10" to 1/4" thick, as desired. Most Canadian veneer (rotary cut) is cut 1/32" thick (for hardwoods) and 1/8" (for softwoods). The upper limit of thickness for material to be classified as veneer is 1/4".

APPENDIX A-3

VENEER (cont'd)

Veneer may also be produced by slicing in which a log is held horizontally in a frame and oscillated vertically against a fixed knife or alternatively the log is fixed while the knife oscillates either vertically or laterally. In any of these methods a very thin veneer (down to 1/200") may be produced from the higher quality species for the upper grades of furniture and cabinet making. Other systems of veneer cutting such as "stay log" are employed to develop specialized patterns and grades of veneer. Most of the species cut by slicing in Canada are imported from the U.S.A. and tropical regions.

Veneer may also be produced, especially in heavier thicknesses eg., 1/4" by sawing although this is not currently employed in Canada.

Veneer itself is not covered by CSA standards although in the coniferous plywood standards the grades of veneer specific to a plywood panel grade are described.

APPENDIX A-4

WAFERBOARD PLANTS - CANADA & U.S.A.

APPENDIX A-4 - WAFERBOARD PLANTS - CANADA & U.S.A.

CANADA

Operating Mills	Capacity (millions of sq.ft. - 3/8")
Great Lakes Forest Products Limited	
Thunder Bay, Ontario	120
MacMillan Bloedel Limited	
Hudson Bay, Saskatchewan	150
Thunder Bay, Ontario	130
Waferboard Corporation	
Timmins, Ontario	80
Weldwood of Canada	
Longlac, Ontario	125
Slave Lake, Alberta	125
Northwood Panelboards Limited	
Chatham, N.B.	160
* Normick-Perron Ltee	
La Sarre, Quebec	50
* Mallette Waferboard	
St. Georges de Champlain, Quebec	120
Total Capacity 1981	1,060
Under Construction	
Grant Waferboard	
Englehart, Ontario	110
* Forex-Leroy	
Val d'Or, Quebec	110
Total Capacity 1983	1,280

* Can produce OSB.

APPENDIX A-4

UNITED STATES

Operating Mills	Capacity (millions of sq.ft. - 3/8")
Blandin Wood Products Minnesota	270
Louisiana Pacific Wisconsin	130
* Elmendorf N. Hampshire	100
Georgia Pacific Maine	165
Northwood Minnesota	160
Potlatch Corp. Minnesota	150
Weyerhaeuser Michigan	250
Total Capacity	1,225
Under Construction	
Potlatch Corp. Minnesota	150
Louisiana Pacific Maine	170
Total Under Construction	320
Total Capacity 1983	1,545

* Can produce OSB.

APPENDIX A-5

ROAD & RAIL TRANSPORTATION RATE DETAILS

APPENDIX A-5 - ROAD & RAIL TRANSPORTATION RATE DETAILS

INTRODUCTION

The rates shown in Table 29 are valid to March 30, 1982. Rates are, however, in a constant state of change and should be verified from time to time.

Although Edmonton has been used as the shipping point for comparison purposes, Table 30 shows rates from probable industrial sites in Alberta which can be used to make any adjustments considered desirable.

TABLE 29 - ROAD & RAIL TRANSPORTATION RATE DETAILS

TO MARCH 30, 1982

($C/100 lbs.)

	BOARDS & SHEETS				PLYWOOD		
	RAILWAY	PIGGY-BACK	TRUCK	STORAGE	RAILWAY	PIGGY-BACK	TRUCK
TO: TORONTO, ONT.							
Chatham, N.B.	1.24-135M	1.24-45M*					
Val d'Or, Que.	1.10-105M						
Longlac, Ont.	1.18-105M		1.09-80M				
Portland, Ore.	5.62-165M		6.45-42M		6.24-140M		6.45-42M
Medford, Ore.	5.62-165M		6.95-42M		6.24-140M		6.95-42M
Hayward, Wisc.	2.99-100M		2.86-44M				
Vancouver, B.C.	3.90-133M	4.09-45M	4.21-72M		4.06-105M	4.09-45M	4.21-72M
Edmonton, Alta.	3.76-165M		3.08-70M				
TO: MONTREAL, QUE.							
Chatham, N.B.	1.03-135M						
Val d'Or, Que.	0.68-150M						
Longlac, Ont.	1.40-105M						
Portland, Ore.	5.72-165M				5.89-140M		
Medford, Ore.	5.72-165M				5.89-140M		
Hayward, Wisc.	3.37-100M						
Vancouver, B.C.	3.90-133M	4.09-45M	4.21-72M		4.06-105M	4.09-45M	4.21-72M
Edmonton, Alta.	3.76-165M		3.99-70M				

* Substitute Service.

General: Rates to/or from U.S.A. are shown in U.S. funds exchange rate on railway approximately 60% of total exchange rate.

Note:

(1) M = 1,000 lbs. The figures adjacent to the dollar values refer to the minimum weight per car (or truck) which must be loaded to obtain the rate shown. For example, to obtain the $1.24 per 100 lbs. rate from Chatham, N.B. to Toronto the rail car must contain 135,000 lbs. net weight.

(2) Boards and sheets refer to waferboard, particleboard and veneer.

(3) Storage means rail into storage into truck. Applies only to some shipments into the U.S.

TABLE 29 - ROAD & RAIL TRANSPORTATION RATE DETAILS TO MARCH 30, 1982 (cont'd)

($C/100 lbs.)

	BOARDS & SHEETS				PLYWOOD		
	RAILWAY	PIGGY-BACK	TRUCK	STORAGE	RAILWAY	PIGGY-BACK	TRUCK
TO: WINNIPEG, MAN.							
Longlac, Ont.	1.64-105M						
Hudson Bay, Sask.	0.88-100M						
Thunder Bay, Ont.**			0.89-70M				
Vancouver, B.C.	3.05-133M		3.37-72M		3.18-105M		3.37-72M
Edmonton, Alta.	1.42-165M		1.41-72M				
TO: REGINA, SASK.							
Thunder Bay, Ont.**	2.42-90M						
Hudson Bay, Sask.	0.70-90M						
Longlac, Ont.	3.07-105M						
Mitsue, Alta.	1.55-105M		1.44-66M				
Vancouver, B.C.	2.46-133M		2.84-72M		2.57-105M		2.84-72M
Edmonton, Alta.	1.20-165M		1.25-70M				
TO: SASKATOON, SASK.							
Thunder Bay, Ont.**	2.76-90M						
Hudson Bay, Sask.	0.66-90M						
Mitsue, Alta.	1.14-105M		1.35-66M				
Vancouver, B.C.	2.46-133M		2.84-72M		2.57-105M		2.84-72M
Edmonton, Alta.	0.80-165M		1.15-70M				

** Thunder Bay not used as control of sales for Hudson Bay, Sask. and Thunder Bay, Ont. by one firm.

TABLE 29 - ROAD & RAIL TRANSPORTATION RATE DETAILS

TO MARCH 30, 1982 (cont'd)

($C/100 lbs.)

	BOARDS & SHEETS				PLYWOOD		
	RAILWAY	PIGGY-BACK	TRUCK	STORAGE	RAILWAY	PIGGY-BACK	TRUCK
TO: CALGARY, ALTA.							
Hudson Bay, Sask.	1.42-80M						
Mitsue, Alta.	0.80-100M		1.05-70M				
100 Mile House, B.C.							
Vancouver, B.C.	1.47-133M		1.74-72M		1.53-105M		1.74-72M
Edmonton, Alta.	0.57-100M				1.31-100M		1.44-70M
TO: VANCOUVER, B.C.							
Mitsue, Alta.	1.83-100M		1.69-70M				
Hudson Bay, Sask.	2.58-100M						
Edmonton, Alta.	1.63-100M		1.47-72M				
TO: NEW YORK, N.Y.							
Chatham, N.B.				2.88-45M			
Val d'Or, Que.	2.42-80M		2.80-45M				
Longlac, Ont.	3.04-105M			3.25-45M			
Portland, Ore.	5.26-165M				5.73-140M		
Medford, Ore.	5.26-165M				5.73-140M		
Hayward, Wisc.	3.69-125M						
Vancouver, B.C.	5.26-120M				5.51-110M		
Edmonton, Alta.	5.03-165M						

TABLE 29 - ROAD & RAIL TRANSPORTATION RATE DETAILS TO MARCH 30, 1982 (cont'd)

($C/100 lbs.)

	BOARDS & SHEETS				PLYWOOD		
	RAILWAY	PIGGY-BACK	TRUCK	STORAGE	RAILWAY	PIGGY-BACK	TRUCK
TO: PHILADELPHIA, PA.							
Chatham, N.B.				3.21-45M			
Val d'Or, Que.	2.42-80M						
Longlac, Ont.	3.04-105M			3.55-45M			
Portland, Ore.	5.26-165M		5.83-44M				
Medford, Ore.	5.26-165M		6.66-44M				
Hayward, Wisc.	3.69-125M						
Vancouver, B.C.	5.26-120M				5.51-110M		
Edmonton, Alta.	4.93-165M						
TO: CHICAGO, ILL.							
Val d'Or, Que.	2.18-100M		2.62-45M				
Longlac, Ont.	2.25-80M		2.55-45M				
Portland, Ore.	3.77-165M		3.87-44M		3.85-140M		3.87-44M
Medford, Ore.	4.27-165M		5.03-44M		4.27-140M		5.03-44M
Hayward, Wisc.	1.21-70M		0.99-46M				
Thunder Bay, Ont.	1.77-90M		1.79-44M				
Vancouver, B.C.	3.86-130M	3.15-44M	4.50-42M		3.96-44M	3.15-44M	4.50-42M
Edmonton, Alta.	4.17-165M		4.26-42M				
TO: KANSAS CITY, MO.							
Longlac, Ont.	2.84-105M						
Thunder Bay, Ont.	2.39-90M						
Hayward, Wisc.	1.59-70M		1.49-44M				
Portland, Ore.	3.37-165M		3.61-44M		3.46-140M		3.61-44M
Medford, Ore.	3.37-165M		4.62-44M		3.46-140M		4.62-44M
Vancouver, B.C.	3.46-130M	3.15-44M	4.38-45M		3.55-110M	3.15-44M	4.38-45M
Edmonton, Alta.	3.71-165M		4.13-42M				

TABLE 29 - ROAD & RAIL TRANSPORTATION RATE DETAILS

TO MARCH 30, 1982 (cont'd)

($C/100 lbs.)

	BOARDS & SHEETS				PLYWOOD		
	RAILWAY	PIGGY-BACK	TRUCK	STORAGE	RAILWAY	PIGGY-BACK	TRUCK
TO: MIAMA, FLA.							
Val d'Or, Que.	3.66-105M		4.26-45M				
Longlac, Ont.	3.74-105M		4.35-45M				
Portland, Ore.	4.84-165M				4.86-140M		
Medford, Ore.	4.84-165M				4.86-140M		
Hayward, Wisc.	4.76-80M						
Corrigan, Texas	2.73-100M						
Vancouver, B.C.	4.85-130M				4.89-110M		
Edmonton, Alta.							
TO: HOUSTON, TEXAS							
Thunder Bay,Ont.	3.89-90M						
Hayward, Wisc.	2.46-165M						
Portland, Ore.	3.83-165M		4.29-44M		3.83-140M		4.29-44M
Medford, Ore.	3.94-165M		4.83-44M		3.86-140M		4.83-44M
Corrigan, Texas	0.43-50M		0.33-44M				
Vancouver, B.C.	3.83-130M	3.15-44M	6.44-45M		3.93-110M	3.15-44M	6.44-45M
Edmonton, Alta.	4.67-165M		6.34-46M				
TO: LOS ANGELES, CALIF.							
Hayward, Wisc.	4.11-115M						
Portland, Ore.	0.97-165M				1.14-140M		
Medford, Ore.	0.79-165M				0.93-140M		
Mitsue, Alta.	3.06-170M						
Corrigan, Texas	4.17-75M				4.17-75M		
Vancouver, B.C.	2.31-130M		3.15-48M		2.60-100M		3.15-48M
Edmonton, Alta.	2.86-170M		5.36-48M				

TABLE 29 - ROAD & RAIL TRANSPORTATION RATE DETAILS

TO MARCH 30, 1982 (cont'd)

($C/100 lbs.)

	BOARDS & SHEETS				PLYWOOD		
	RAILWAY	PIGGY-BACK	TRUCK	STORAGE	RAILWAY	PIGGY-BACK	TRUCK
TO: PHEONIX, ARIZ.							
Hayward, Wisc.	4.30-115M						
Portland, Ore.	1.45-165M				1.71-140M		
Medford, Ore.	1.27-165M				1.50-140M		
Mitsue, Alta.	3.56-170M						
Corrigan, Texas	2.55-115M				2.55-115M		
Vancouver, B.C.	3.08-130M		6.30-45M		4.00-100M		6.30-45M
Edmonton, Alta.	3.36-170M		5.04-48M				

TABLE 30 - ROAD & RAIL TRANSPORTATION RATE DETAILS -
ALBERTA LOCATIONS -
TO MARCH 30, 1982

From:	Tor. ONT.	Mont. QUE.	Winn. MAN.	Reg. SASK.	Van. B.C.	Edm. ALTA.	Calg. ALTA.	Van. WASH.	Hous. TEX.	L.A. CALIF.	Chic. ILL.
Mitsue, Alta.	4.11	4.11	1.95	1.57	1.98	.56	.85	2.22	5.11	3.31	4.32
High Prairie, Alta.	4.11	4.11	2.02	1.66	2.15	.80	1.04	2.24	5.11	3.31	4.32
Whitecourt, Alta.	4.11	4.11	1.90	1.49	2.03	.48	.72	2.22	5.08	3.04	4.20
Hinton, Alta.	4.11	4.11	1.92	1.61	1.28	.64	.78	2.18	5.08	2.86	4.20
Lac La Biche, Alta.	4.11	4.11	1.90	1.57	1.92	.46	.70	2.24	5.08	3.11	4.20
Rocky Mtn. House, Alta.	4.11	4.11	2.00	1.32	1.72	.54	.56	1.98	5.08	3.18	4.20

APPENDIX A-6

OVERSEAS TRANSPORTATION

APPENDIX A-6 - OVERSEAS TRANSPORTATION

With the exception of softwood plywood, overseas sales of Canadian produced panel products are virtually non-existent. Additionally, sales of plywood are confined almost entirely to Western Europe (93% or 572 million sq.ft., 3/8" basis of total exports in 1980) and for several years have experienced almost a nil growth rate. Despite a long-term and aggressive sales promotion campaign carried on by manufacturers and exporters, acceptance of softwood plywood in Japan and other Pacific rim countries remains at a low level.

Forest industry experience has shown that only products which are structured to meet specific end-use requirements or which possess natural or contrived characteristics not readily duplicated can be successfully marketed in overseas regions. Examples of this type of product are:

Factory face - finished "thin" particleboard
Pine and cedar panelling
Knocked-down cedar furniture components
Medium density fibreboard (4' - 0" x 8' - 0" x various thicknesses)
High-density (50#/ft.^{3}) particleboard door - cores (3' - 6' x 8' - 0" x 1 1/2")

In general, successful overseas sales of these products has been achieved through careful end-use market selection and development of characteristics to suit those selected end-uses. A relatively high value to weight ratio was achieved which in turn sharply reduced the negative effect of transport costs on sales distribution.

Undoubtedly, products manufactured in Alberta would be exported from either Vancouver or Prince Rupert, B.C. and shipments of virtually all forest products from these ports are controlled by three exporters; Seaboard Lumber Sales Ltd., MacMillan & Bloedel Ltd., and East Asiatic Company. Japanese controlled shipments of pulp-chips and pulp are also a major activity. All of these organizations either operate their own vessels or charter at the best terms and

APPENDIX A-6

the most advantageous shipping arrangements for Alberta-produced materials could probably be obtained through agreement with one or more of these established major exporters. However, it should be noted that these export organizations are all affiliated with forest product manufacturers and precautions should be taken to ensure that a conflict-of-interest position is not created with the selected export group.

Both Pacific rim and European markets can be serviced equally well from B.C. For the Japanese market, major competitors would be New Zealand, South East Asia, United States, and the U.S.S.R. Except for New Zealand, however, which supplies increasing volumes of MDF to Japan, all of these regions provide only commodity items such as logs and lumber, and neither of these would be attractive to Alberta.

Western Europe is supplied by regions with excess fibre resource with growing volumes being obtained from sources outside of the traditional supply areas such as Scandinavia.

In summary, it seems apparent that successful overseas sales of Alberta produced material will depend primarily on careful selection of end-use markets and structuring products to suit those markets. Ideally, these products should be compatible with Alberta's poplar resource and embody characteristics which are not easily duplicated. Commodity products such as standard lumber, plywood, particleboard, waferboard, and fibreboard would not be attractive export products.

APPENDIX A-7

DETAILS OF CANADIAN & U.S.A. PANEL PRODUCTS INDUSTRY

APPENDIX A-7 - DETAILS OF CANADIAN & U.S.A. PANEL PRODUCTS INDUSTRY

INTRODUCTION

This appendix contains a more detailed analysis of the Canadian Panelboard industry than is presented in the body of the report. Inevitably, some repetition does occur but has been kept to the minimum possible. All volumetric data has been converted to 3/8" equivalent to facilitate comparisons between the various panels.

NORTH AMERICAN CAPACITY

It is important to keep in mind the relationship between the United States and Canadian panel industries as shown in Table 31. The United States is virtually self-sufficient in all types of panel, with the exception of some thin particleboard, hardwood plywood, and veneers. This limits the marketing opportunities for Canada.

TABLE 31

NORTH AMERICA

ESTIMATED INSTALLED CAPACITY

FOR

WOOD-BASED PANELS - 1982

(Volumes in millions of sq.ft. - 3/8")

	CANADA			U.S.A.
	Mills	Volume	Value [1] ($000)	Volume
Coniferous Plywood	31	3,200	605,000	21,000
Poplar Plywood	4	140	25,000	-
Hardwood Plywood	6	100	25,000	2,500
Waferboard (incl. OSB)	11	1,060 [2]	103,000	1,230 [2]
Particleboard	11	1,170	118,000	8,000
Hardboard	4	270	110,000	2,900
Rigid Insulation Board	9	750	56,000	5,700
Medium Density Fibreboard	-	-	-	1,200
TOTAL	76	6,690	1,042,000	42,530

Source: Statistics Canada; U.S. and Canadian Industry Reports; F.A.O.

1. Value = Value of shipments @ estimated average F.O.B. value.

2. Under Construction: U.S.A., 2 mills = 320 MM sq.ft.
Canada, 2 mills = 220 MM sq.ft.

APPENDIX A-7

THE CANADIAN MARKET FOR WOOD-BASED PANELS

Generally wood-based panels may be categorized as (a) structural, or exterior type or (b) non-structural, based broadly on the type of adhesive employed and the moisture resistant quality of the panel. There is some overlap in this breakdown because "non-waterproof" panels, e.g., underlay grade particleboard may be employed for an identical use for exterior grade plywood.

Domestic consumption of wood-based panels has developed as follows:

TABLE 32

CANADA

PRODUCTION, SHIPMENTS & CONSUMPTION

OF

WOOD-BASED PANELS

(Volumes in MM sq.ft. - 3/8")

	Coniferous Plywood						Waferboard					
		Shipments						Shipments				
Year	Prod.	Export	Domestic	Total	Import	App. Cons.	Prod.	Export	Domestic	Total	Import	App. Cons.
1960	1,031	123	913	1,036	4	917	-	-	-	-	-	-
1965	1,673	334	1,222	1,556	2	1,224	50	-	35	35	-	35
1970	1,879	401	1,533	1,934	12	1,545	65	-	62	62	-	62
1975	2,054	282	1,722	2,004	513	2,228	310	145	160	305	-	160
1980	2,530	578	2,188	2,766	13	2,101	618	341	312	653	-	312
1981	2,343	421	1,904	2,325	160	2,064	789	338	417	755	-	417
	Particleboard						Hardwood Plywood					
1960	-	-	-	-	neg.	neg.	100	19	75	94	4	98
1965	140	neg.	122	122	8	130	120	32	74	106	87	161
1970	321	neg.	290	290	46	336	90	15	73	88	140	213
1975	641	17	621	638	197	818	95	10	98	108	360	458
1980	816	128	667	795	56	723	80	20	62	82	68	130
1981	732	104	686	790	125	811	75	20	50	70	70	120

TABLE 32 (cont'd)

CANADA

PRODUCTION, SHIPMENTS & CONSUMPTION

OF

WOOD-BASED PANELS

(Volumes in MM sq.ft. - 3/8")

	Poplar Plywood [1]						Hardboard					
		Shipments						Shipments				
Year	Prod.	Export	Domestic	Total	Import	App. Cons.	Prod.	Export	Domestic	Total	Import	App. Cons.
1960	120	neg.	112	112	-	112	n/a	n/a	n/a	n/a	n/a	86
1965	150	neg.	148	148	-	148	n/a	n/a	n/a	n/a	n/a	118
1970	150	neg.	139	139	-	139	200	54	138	192	19	157
1975	170	5	160	165	-	160	215	23	191	214	28	219
1980	130	20	100	120	-	100	232	36	200	236	45	245
1981	130	20	90	110	-	90	190	40	145	185	51	196
	Rigid Insulation Board						Medium Density Fibreboard					
1960	500	43	487	529	-	487	-	-	-	-	-	-
1965	700	59	634	693	16	650	-	-	-	-	-	-
1970	695	43	645	688	17	662	-	-	-	-	15	15
1975	645	25	661	686	68	729	-	-	-	-	30	30
1980	584	73	578	651	11	589	-	-	-	-	40	40
1981	652	86	540	626	11	551	-	-	-	-	50	50

Source: Statistics Canada.
Industry Reports and Estimates.

1. Exterior and interior types combined.

APPENDIX A-7

STRUCTURAL (EXTERIOR) PANELS

The development of domestic markets for exterior panels is shown in Table 33 which indicates the pattern of consumption of the various panels which by their composition or technical qualities are employed for somewhat similar uses to softwood plywood and waferboard. A portion of the particleboard and insulation board consumed in Canada is in this category even though the panels are made with non-exterior adhesive. Data on products such as one inch lumber and gypsum sheathing panels, which are competitive with wood based panels, is not readily available.

Softwood plywood continues to dominate the exterior panel market although the percentage share has declined from 81% in 1965 to about 67% in 1981. Both softwood plywood and exterior grade poplar plywood are now incorporated into one category "Construction Plywood" in Statistics Canada Reports.

From 1950 to 1960 Douglas fir plywood made its greatest impact, growing by 12.6% annually to reach 917 million sq.ft. in 1960. Substitution of one inch lumber by plywood was the major factor in this period.

During the period 1960 to 1970 domestic consumption of plywood, which by then included CSP [1] sheathing plywood and some imports, grew, but at a declining annual rate of just over 5%. The rate of growth declined again to about 3.7% in the next five years ending in 1975. In the 5 year period 1973 - 1978 the annual rate of growth was 3.5%. Consumption will probably decline steadily in the future as waferboard consumption expands.

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1. Canadian Softwood Plywood.

TABLE 33

ESTIMATED CONSUMPTION - "EXTERIOR" PANELS

(Volumes in millions of sq.ft. - 3/8")

Year	Softwood Plywood D.Fir	Softwood Plywood CSP	Softwood Plywood Imports	Softwood Plywood Total	Poplar Plywood	Wafer-board	Particle-board	Rigid Insul. Board	Total
1950	290	-	-	290	4	-	neg.	n/a	300-/+
1955	699	-	-	699	35	-	neg.	n/a	800-/+
1960	881	32	4	917	67	-	25	100	1,109
1965	1,008	214	2	1,224	75	35	25	144	1,503
1970	1,103	430	12	1,545	75	62	50	174	1,906
1975	1,044	671	513	2,228	76	160	160	243	2,867
1980	1,105	983	13	2,101	100	312	190	200	2,903
1981	898	935	160	2,064	66	417	200	200	2,947

Source: Statistics Canada

Notes:

(1) Exterior means competes with the exterior quality adhesives as used in softwood plywood.
(2) Imports are nearly all Douglas Fir from the Pacific Northwest - U.S.A.
(3) Exterior grade poplar plywood represents about 60% of all poplar plywood produced; the balance is generally used for non-structural purposes.
(4) Estimated that 20% of all particleboard consumed, including imports, was non-exterior type, but was used as floor underlay and mobile home decking in the period 1960-1970. From 1970 to date, the ratio estimated is 30%.
(5) Asphalt sheathing competes directly with plywood and waferboard sheathings. Other insulation boards are not directly competitive and are therefore excluded.

APPENDIX A-7

STRUCTURAL (EXTERIOR) PANELS (cont'd)

The output of Douglas fir plywood has peaked. It is estimated that the upper grades such as sanded, concrete form and specialty grades of Douglas fir plywood now represent less than 45% of the total Douglas fir plywood produced. Virtually all of the CSP plywood, mainly spruce, is in sheathing grades. Probably 1.5 billion sq.ft. or 75% of the total softwood plywood consumed domestically in 1981 was in a sheathing grade.

Imported softwood plywood from the United States became significant in 1973 when it represented 5% of plywood consumption. The volume rose to a peak of 23% of softwood plywood consumption in 1975 when the United States market was weak and a large surplus of plywood became available for export to Canada.

The significantly lower cost of United States softwood plywood in the Pacific Northwest then enabled substantial shipments to be made to the Toronto-Montreal region, over the Canadian tariff of 15%, at prices well below delivered prices of plywood made on the B.C. Coast. Most of the plywood imported was Douglas fir and slightly more than 65% of this was "CDX" sheathing, a grade lower than the minimum grade permitted under Canadian Standards grading rules. CDX is not produced in any Canadian mill.

Due to the present economic decline in the United States domestic market, the volume of U.S. plywood imported has increased again - mainly in the last half of 1981.

APPENDIX A-7

EXTERIOR PANELS - DOMESTIC MARKET SECTORS

A general but not precise indication of market trends for both lumber and exterior wood-based panels is the pattern of new housing starts. Unfortunately, it is virtually impossible to develop a mathematical correlation between total consumption of panels and housing.

Based on a examination of the consumption of "exterior" panels for 1979 and 1981, it appears that new residential construction accounted for about 30% of the total market for these panels as shown in Table 34. The total volumes of plywood and waferboard estimated to be consumed in residential construction and home renovation in 1981, that is 1,634 million sq.ft., is reasonably close to the average figure of 1,690 million estimated by Lamb-Guay [1].

The estimated consumption of plywood and waferboard combined suggests that home renovation and new residential construction account for about 60% of all exterior panels used in Canada.

1. "Outlook for the North American Structural Board Industry 1979-1984." Lamb-Guay Inc., October 1980.

TABLE 34

CANADA

ESTIMATED CONSUMPTION OF "EXTERIOR" PANELS

BY MARKET SECTOR - 1981

(Volumes in millions of sq.ft. 3/8")

Sector	Construction Plywood		Wafer-board		Particle-board		Insulation Board		Total	
	%	Vol.	%	Vol.	%	Vol.	%	Vol.	%	Vol.
Residential Construction	26	554	50	209	40	80	45	90	32	933
Homeowner/ Renovation	35	746	30	125	15	30	5	10	31	911
Sub-Total	61	1,300	80	334	55	110	50	100	63	1,844
Non-Residential Construction	14	298	8	33	10	20	20	40	13	391
Farm	6	128	8	33	-	-	15	30	6	191
Industrial	19	404	4	17	35	70	15	30	18	521
Total	100	2,130	100	417	100	200	100	200	100	2,947

APPENDIX A-7

CONSTRUCTION PLYWOOD

The estimated 35% level of consumption of construction plywood in the "homeowner" sector underlines the importance of this segment. Up to 1980, while housing and general construction generally declined, the domestic consumption of plywood had risen probably because of the increasing volume purchased through the retail lumber yards by individuals and small contractors who were adding to or improving primary residences in numerous ways. This trend appears to extend to the other panel products, especially waferboard. Rising interest rates, capital and land costs tend to restrain the purchase of new homes by those who require larger family accommodation so they modify their existing residences. There is substantial visual evidence of this which is not identified in housing statistics. Canada Mortgage and Housing Corporation reports do, however, show that the ratio of dollars spent in major repairs and maintenance of residential construction has risen from 8% of the combined cost of repair and construction in 1970 to 17% in the period 1974 - 1978. Shifts in regional consumption patterns are additional factors.

POPLAR PLYWOOD - EXTERIOR TYPE

The relatively small annual production and domestic consumption of exterior-type poplar plywood for sheathing and underlayment will probably remain stable at about 70 million sq.ft. Some of the CSP plywood produced in Eastern Canada may contain poplar veneers in the inner plies and some of the poplar plywoods may contain spruce inner plies. This pattern will, in all probability, be maintained in the future.

APPENDIX A-7

PARTICLEBOARD - EXTERIOR USE

Particleboard used in the "exterior" application consists of the relatively small volume of industrial particleboards which are consumed as underlays and mobile home decking in lieu of softwood plywood and waferboard. These are used in protected applications on the basis of surface qualities, size of panel available and competitive pricing. It is probable that the consumption of these technically non-exterior panels has stabilized at about 200 million sq.ft. annually. Sanded waferboard is penetrating this market.

RIGID INSULATION BOARD

The consumption of asphalted and plain sheathing panels, which compete with softwood plywood and waferboard in wall sheathing applications, appears to be declining. Since use of this product is concentrated in Quebec and Ontario the future development of waferboard in that region will probably affect it more seriously than will softwood plywood.

The sheathing type insulation board panels are more costly in service when the thickness required to meet standards of insulation is considered. The various fibreglass and styrene panels are more efficient and economical and therefore highly competitive in this respect.

APPENDIX A-7

WAFERBOARD

In 1970, waferboard represented 3.8% of the combined Canadian domestic consumption of waferboard and exterior plywood, including sanded Douglas fir. In 1978, the ratio was estimated at 9%, even though the consumption of exterior plywood had shown a modest increase. In terms of combined waferboard and sheathing grade plywood only, waferboard now represents slightly more than 20% of domestic consumption on a national basis and probably 30 - 40% in Eastern Canada.

Waferboard competes with softwood plywood in sheathing and general utility uses, for crating and temporary construction uses; it may be painted or stained for decorative applications.

The basic difference in wood costs - poplar averages about $50/cunit, compared to $100 per cunit for sheathing grade peelable logs, together with significantly smaller labour costs which offsets the effect of higher glue costs and capital costs make waferboard a highly successful product.

NON-STRUCTURAL PANELS - DOMESTIC MARKET

Industrial Particleboard

This segment of the panel industry has performed well over the past five years rebounding from a period of intense competition by United States imports to a position where exports are now significant.

APPENDIX A-7

Industrial Particleboard (cont'd)

Major markets for particleboard, practically all of which is bonded with urea-formaldehyde resin, are the kitchen cabinets, home and office furniture, counter tops, shelving, floor underlay, store fixtures, and general industrial sectors. Generally, for these segments, the panels are relatively thick - from 3/8" to 1", averaging 11/16", and a significant volume is eventually finished with various overlays - vinyl, melamine, polyester sheets, or printed, painted, stained, etc. to give a decorative effect. Some is overlaid with decorative veneer.

Many of the end products are cut-to-size either at the producing mill or by the secondary fabricator.

A fairly recent development is the production of "thin" particleboard, i.e., from about 1/8" to 1/4" in thickness and generally made with specialized press equipment such as the calendar type press - the "Mende" system, or a large single opening horizontal press. This type of panel accounts for about 15% of the total particleboard production from 1975 onward and accounts for about 25% of the exports in 1981.

Thin panels are used for the most part as a substrate on which to print or bond paper and other finishes to make decorative wall panels. Thin particleboard also substitutes, in the plain form, for hardboard and unfinished imported lauan plywood in uses such as furniture components - backs, drawer bottoms, etc. For reasons such as changes in timber policy, transportation cost increases, exchange rates, etc. lauan plywood has become very costly and therefore uneconomic for the North American pre-finishing industry.

APPENDIX A-7

Industrial Particleboard (cont'd)

In the period 1974-1977, there was a significant volume of particleboard imported at a very low price from the Western United States which had a serious effect on the Eastern Canadian industry. The price was the result of abundance of low cost sawmill, plywood mill waste which could be economically converted to particleboard while, at the same time, Canadian mills were generally using substantial volumes of more expensive roundwood. However, the recent demand for wood material for both energy and pulpmill furnish combined with a reduction in the volume available because of improved sawmill efficiencies in the U.S.A. has increased the value of "waste". The present cost of manufacture of particleboard in the U.S.A., to which is added freight, currency exchange rate and Canadian tariffs, have made Canadian particleboard highly competitive. In addition, Canadian mills are now, mainly, based on the conversion of waste material from either "captive" sawmills or have long term contracts with mills in proximity to them.

MDF

Medium Density Fibreboard (MDF), made by pressure refining wood material, as opposed to the mechanical breakdown of material such as in particleboard, is not yet made in Canada but, as shown in Table 32, is being imported from the U.S.A. in increasing volumes. MDF is superior to standard particleboard for most uses - especially for overlays, direct printing and applications where high quality machining and edge banding requirements are necessary. The delivered cost in the major market area - Toronto/Montreal is high, approximately $440 per M sq.ft. - 5/8", which is attributable to the trans-continental freight rates on a relatively heavy panel, the value of the Canadian dollar and duty. The delivered cost of both particleboard at a weight of about 2,100 lbs. per M sq.ft. and MDF at about 2,500 lbs. per M sq.ft. becomes critical when they are required to be moved over long distances.

APPENDIX A-7

MDF (cont'd)

Several studies have been made to determine the economics of an MDF mill in Canada based on sites where substantial volumes of low grade hardwood species and/or coniferous sawmill waste is available. Generally these are in Eastern Canada to overcome or reduce the outbound freight charge on the product. With the exception of one line in a mill being modified from particleboard production in New Brunswick, the concensus is that the Canadian market in itself is still too small to support a mill (probable minimum economic output of 80 million sq.ft. - 5/8") and capital cost is too high at the moment. Since the establishment of a mill in Eastern Canada would reduce the delivered cost of MDF to the consuming industries by a substantial amount, the concern over market penetration may not be completely valid. A 25 -30% reduction in cost would stimulate interest in MDF and expand consumption by 30% according to some estimates. Probably though, about 35% of the mill output would still have to be exported.

HARDWOOD PLYWOOD

The downward trend in Canadian consumption of hardwood plywood shown in Table 32 reflects the sharp decline in imports of lauan plywoods used either for direct printing, pre-finishing or used in various applications in furniture, fixtures, and cabinet manufacture, etc. In the mid 1970's, lauan plywood imports totalled up to 400 million sq.ft. (3/8") - dominating the market and virtually destroying, with the assistance of the pre-finished hardboards, the Canadian decorative hardwood plywood industry (based on yellow birch).

APPENDIX A-7

HARDWOOD PLYWOOD (cont'd)

The Canadian industry is now to all intents and purposes a veneer producing and exporting industry with the exception of a small output of high valued, cabinet panels (often made with imported veneer faces) and birch doorskins. An additional small volume of hardwood veneers is overlaid on thin particleboard but practically all wall panelling is now made by pre-finishing thin particleboard or hardboard. The bulk of the hardwood pywood exported is birch doorskins which are produced in only two mills in Quebec.

HARDBOARD

The Canadian hardboard industry has, similarly to the hardwood plywood industry, undergone significant changes over the past five years. In 1970, production totalled 200 million sq.ft. (3/8") of which 66% was either siding or plain "brown" board. The balance was produced as pre-finished panelling in the hardboard mills, and some of the "brown" board was also pre-finished at other establishments. The total Canadian consumption of pre-finished hardboard has declined by an estimated 50% since 1972 to about 98 million sq.ft. which includes doorskins and wall panels. All Canadian production is made by the "wet" process, ie., the mat is formed in a water medium and pressed with a high water content.

Hardboard siding production now represents about 50% of industry capacity for all products. Siding is made in three of the four producing mills. (The mill in B.C. cannot make siding because of the limit of press size).

An indication of the pattern of consumption of all types of panels in Canada in 1978 and 1979 is shown in Table 35 of this appendix.

TABLE 35

CANADA
VALUE OF WOOD-BASED PANELS CONSUMED
IN
SECONDARY MANUFACTURE
BY SIC CLASS [1]
($000)

	SIC 2543		SIC 2544		SIC 2541		SIC 2619	
	1978	1979	1978	1979	1978	1979	1978	1979
Softwood Veneer	992	247	-	-	707	436	-	-
Hardwood Veneer	n/a	624	2,649	3,112	5,994	6,259	-	-
Softwood Plywood	12,735	14,894	2,278	1,724	6,255	10,566	4,517	4,704
Hardwood Plywood	2,010	2,312	4,998	4,714	15,148	19,379	5,864	6,608
Particleboard	n/a	2,757	7,987	11,750	4,163	5,275	8,564	10,734
Particleboard - Veneered	-	-	3,753	4,379	-	-	5,508	8,994
Particleboard - Vinyl or Overlaid	-	-	2,716	3,375	-	-	-	-
Hardboard	1,264	1,510	1,825	2,088	3,128	6,111	5,195	6,955
Insulation Board	3,016	2,976	-	-	-	-	-	-
Plastic Board	-	-	3,759	5,372	4,899	5,895	5,102	6,684
Total	20,017	25,320	29,965	36,514	40,294	53,920	34,750	44,679

TABLE 35 (cont'd)

CANADA
VALUE OF WOOD-BASED PANELS CONSUMED
IN
SECONDARY MANUFACTURE
BY SIC CLASS [1]
($000)

	Office Furniture		Misc. Furniture & Fixtures		Total	
	1978	1979	1978	1979	1978	1979
Softwood Veneer	-	-	1,793	1,268	3,492	1,951
Hardwood Veneer	2,780	3,584	793	969	12,216	14,547
Softwood Plywood	-	-	3,625	3,601	29,410	35,489
Hardwood Plywood	4,817	5,316	3,901	4,925	36,738	43,254
Particleboard	1,795	2,882	2,739	3,015	25,248	36,413
Particleboard - Veneered	-	-	1,345	1,779	10,606	15,152
Particleboard - Vinyl or Overlaid	-	-	-	-	2,716	3,375
Hardboard	-	-	1,278	1,914	12,690	18,578
Insulation Board	-	-	-	-	3,016	2,976
Plastic Board	3,826	6,294	5,420	6,498	23,006	30,743
Total	13,218	18,076	20,894	23,969	159,138	202,478

Source: Statistics Canada.

1. SIC 2543-Manufacturers of Pre-Fab buildings.
SIC 2544-Manufacturers of Wooden Kitchen Cabinets.
SIC 2541-Sash, Door and other Millwork Plants.
SIC 2619-Manufacturers of Household Furniture.

APPENDIX A-7

HARDBOARD (cont'd)

Industry sources are somewhat pessimistic that the industry will run at full capacity again because of the trends in housing and the competition from the thin particleboards. Capital cost of a new mill, which would require efficient anti-pollution controls, will deter consideration of new facilities also.

Imports of "brown" board from the Eastern Bloc countries have affected Canadian producers who recently successfully invoked the Anti-Dumping Regulations to require extra duty to be paid on shipments made over the past two years.

FUTURE CONSUMPTION

The forecast of consumption of wood based panels over the next ten years is difficult and not all forecasters agree. Based on interviews, combined with CMHC and HUDAC studies and C-H file data, a forecast of housing starts and the associated requirements for all types of panels in Canada is shown in Table 36. Panel consumption, in 3/8" equivalent for each housing start is derived from a 1969 study by Environment Canada [1] with allowances made subjectively for probable reduction in the average size of dwelling. Other than making this general estimate it has not been possible to refine the data within the limitations of this study.

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1. "The use of Wood and Wood-based Building Materials in New Residential Construction in Canada, 1969"; James G. Bowland, Department of Environment, Forestry Service, Ottawa, 1972. Publication no. 1312.

TABLE 36

ESTIMATED AVERAGE ANNUAL HOUSING STARTS AND RELATED WOOD-BASED PANEL CONSUMPTION

1981-1985	B.C.	ALTA.	SASK.	MAN.	ONT.	QUE.	N.B.	N.S.	P.E.I.	NFLD.	TOTAL
Dwelling Type:											
Single Detached	16,300	17,100	5,300	3,400	35,000	21,600	5,300	4,800	800	3,800	113,400
Semi-Det; Row, Duplex	5,700	7,300	600	800	12,400	4,000	400	300	200	500	32,200
Apartment	11,800	12,000	3,000	1,100	25,500	13,800	1,000	1,700	100	800	70,800
Total	33,800	36,400	8,900	5,300	72,900	39,400	6,700	6,800	1,100	5,100	216,400
Panel Consumption Millions sq.ft.-3/8"	118.1	127.7	32.3	20.5	254.4	140.4	27.6	26.4	4.6	20.7	772.7
1986-1990											
Dwelling Type:											
Single Detached	12,200	16,400	5,100	3,200	26,700	21,800	4,000	3,800	600	3,900	97,700
Semi-Det; Row, Duplex	6,900	9,200	1,300	1,000	14,900	5,500	800	600	100	900	41,200
Apartment	8,100	10,900	2,100	700	17,800	9,200	600	1,100	100	800	51,400
Total	27,200	36,500	8,500	4,900	59,400	36,500	5,400	5,500	800	5,600	190,300
Panel Consumption Millions sq.ft.-3/8"	90.4	121.3	29.7	18.0	197.4	127.2	20.4	19.9	3.0	20.8	648.1

Source: CMHC - "Domestic market projections to the year 2000 - Wood Products Industry"
Data modified by C-H.

APPENDIX A-7

FUTURE CONSUMPTION (cont'd)

Factors which determine the pronounced downward trend include:

(a) Population changes - aging of the population groups which form households past the normal formation period. Certain provinces will be affected more than others.

(b) Migration westwards will maintain a relatively high level of demand in Alberta. Ontario's consumption of panels will decline by 22%, Quebec's by 9% in the period 1986 - 1990 compared to the previous five year period..

(c) Immigration may decline.

(d) Housing costs are rising beyond the average wage earner's ability to pay which may result in a decline in single detached dwelling starts.

(e) Interest rates lead to a "doubling" up of families.

(f) Energy and other costs will direct income to the renovation and repair market.

(g) Average size of housing unit will continue to decline, especially single detached.

(h) Multi-family units, e.g., apartments, will decline as fewer single person households become established.

APPENDIX A-8

SUGGESTIONS FOR EFFICIENT POPLAR UTILIZATION

APPENDIX A-7

FUTURE CONSUMPTION (cont'd)

Forecasts by Data Resources Inc. in early 1981 showed an average of 206,000 starts in the 1981-1985 period and 216,000 starts in the period 1986-1990. This last figure is more optimistic than the CMHC prediction but it is still a reduction of about 2% from the period 1976-1980.

A most pessimistic view held by some Canadian sources, is that the trend will continue further downward to an average of about 135,000 starts of all types in the period 1991-1995 and 100,000 in the period 1996-2001. Consumption of wood based panels for new home construction would then be about 440 million sq.ft. and 320 million sq.ft. in the respective periods. This trend, if accurate, would present the structural panel sector - especially plywood and waferboard with serious problems and would seriously impair the market for all materials and construction activity.

In all probability, the "homeowner" or "do-it-yourself" market will remain strong, as shown in Table 34 so that the general home related market will require at least one sq.ft. for "do-it-yourself" for each sq.ft. used in new homes. On this basis, the "home" market would consume about 1.5 billion sq.ft. - 3/8" annually in the period 1981 -1985 and 1.3 billion in the period 1986 - 1990.

Within the total volume of panels likely to be used in new housing annually (773 million sq.ft., 1981 - 1985), the sheathing component (softwood plywood, waferboard, insulation board) probably accounts for 60% or 465 million sq.ft. per year, nationally, while Alberta would consume about 77 million sq.ft. The combined new housing and homeowner demands would at least double this volume so that Alberta might consume something in excess of 150 million sq.ft. of sheathing material annually in the overall housing sector. An additional 150 million would probably be used for all other purposes - industrial, farm, etc. - indicating a total demand for 300 million sq.ft. in the province.

APPENDIX A-7

FUTURE CONSUMPTION (cont'd)

The pattern of regional distribution for Canadian made softwood plywood in 1981 shows Alberta consuming 400 million sq.ft. of construction plywood (including both sanded and sheathing grades) plus an indeterminate volume of waferboard. The average annual consumption of exterior panels in Alberta probably is therefore between 400 and 500 million sq.ft. Some of the shipments probably were re-shipped to other regions, e.g., Yukon and N.W. Territories, since Statistics Canada reports first destinations only. Partly offsetting this portion of the imported softwood plywood would be consumed in Alberta.

The current installed capacity of exterior panel mills in Alberta is approximately as follows:

	(millions of sq.ft. - 3/8")
Construction Plywood	290
Waferboard	125
Insulation Board	100
Total	515

These are all sheathing type products and the capacity is greater than probable current demand. This indicates that any future sheathing type mills planned in the province must consider seriously shipments to markets outside the province and outside Canada.

APPENDIX A-8

SUGGESTIONS FOR EFFICIENT POPLAR UTILIZATION

APPENDIX A-8 - SUGGESTIONS FOR EFFICIENT POPLAR UTILIZATION

GENERAL

While not, strictly, among the immediate objectives of this study, Carroll-Hatch received several suggestions from responsible and knowledgeable sources by which Alberta's over-riding need for utilization of poplar species might be accomplished. Generally, the thought was expressed that the capital funds which have been budgeted for the R&D mill might instead be usefully dispersed to pursue the projects listed below:

1. Integrated Processing Centre

This suggestion relates to the establishment of a log merchandising system whereby poplar species would be logged and brought to a central site in tree lengths, de-limbed branches included, to be sorted on a preliminary basis, and cut into desirable components such as:

(a) Peelable logs for veneer or graded for sawmill production.
(b) Logs for waferizing and/or eventual refining for particleboard.
(c) Residual logs or chunks for pulp chips, chemical conversion, animal fodder, energy, etc.

After being cut, the logs would be transported or conveyed by the most efficient means to a conversion plant. Residuals, such as slabs, edgings, peeler cores, branches, would be converted to the appropriate re-constituted wood panel or other by-product usage.

This pre-supposes a demand for poplar pulp which is, currently, virtually non-existent. However, see Section 2 following.

APPENDIX A-8

GENERAL (cont'd)

1. Integrated Processing Centre (cont'd)

It might be noted that this concept of a central merchandising operation is under advanced study in Eastern Canada based on extensive stands of mixed, dense hardwoods.

In summary, this integrated processing concept would permit extraction and utilization of the entire forest resource, not just selected grades and sizes of trees. Additionally, complete utilization of the resource would undoubtedly result in an economically viable operation.

2. Pulp Production

It would seem highly desirable to develop a project to demonstrate the use of poplar pulp as an additive to coniferous pulp for newsprint. In early 1981 such a test was completed by the Province of Saskatchewan which shipped aspen logs to Sweden for thermo-mechanical pulping and eventual conversion into newsprint which contained the extremely high proportion of 80% poplar. The newsprint was, in turn, used in regular production by several newspapers who reported favourably on its printing quality, controllability and the lack of dust and fine fibre, etc. in the press room. Economics were considered favourable and competitive with standard newsprint.

As noted in the main body of this report, several research and industry executives consider the use of poplar species will only be economically viable when large volumes of the lower quality stems and residual material can be consumed at a scale of at least a small pulp mill. The merchandiser concept in paragraph 1, would probably only succeed economically if such a use was developed.

APPENDIX A-8

GENERAL (cont'd)

3. Advanced Lumber Preparation Techniques

Develop new methods of producing aspen studs such as the "SDR" (saw, dry and rip) concept [1] in which logs are live sawn to 1 3/4" thick flitches. These are then kiln dried at high temperatures (230^{o} F.) to about 12% M.C. Following drying, the flitches are ripped and then surfaced to produce nominal structural sizes of 2" x 4", 2" x 6", etc. This method reportedly reduces the typical and serious loss prevalent in aspen stud manufacture due to twist, warp, etc. by some 70%. Such a stud manufacturing system would dovetail with the preceding suggestions. It would in all probability require some degree of selection of logs so that uses for the lower valued material would have to be developed. The former stud mill at Mitsue suffered from the problems of non-utilization of a large volume of timber which was delivered but which developed excessive degrade in manufacturing or was rejected in the mill yard. The aspen studs which were produced, however, were of good quality.

SUMMARY

Each of the foregoing suggestions was discussed with selected private and public sector officials and were generally well-received. Analysis of these methods is beyond the scope of this study, however, and the suggestions are noted simply for further consideration by the officials responsible for encouraging more efficient utilization of Alberta's poplar resource.

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1. "Economics of Manufacturing Straight Structual Lumber from Hardwoods"; Harpole, Maeglin, Boome; USFS Laboratory, Madison, Wisconsin.